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AMERICAN ANTIQUITY

VOL. XIX JULY, 1953 No. 1

ARTIFACTS WITH MAMMOTH REMAINS, NACO, ARIZONA

I. Discovery of the Naco Mammoth* and the Associated Projectile Points

EMIL W. HAURY

HISTORY

ON SEPTEMBER 22, 1951, Marc Navarrete brought word to the Arizona State Museum of the discovery of two large projectile points in association with mammoth bones exposed in an arroyo eroded by Greenbush Creek one mile northwest of Naco, Arizona (Fig. 1). Marc Navarrete and his father, Fred, for some fifteen years have been watching the arroyo for fossils as erosion widened and deepened it.

A bone concentration, though known for some time, was freshly exposed by floods resulting from heavy summer rains in August, 1951. This encouraged Fred Navarrete to dig in an attempt to salvage what appeared to be a part of a skull with teeth and tusk of a large animal. In the course of this work he found near the skull a projectile point in what appeared to be undisturbed matrix. Additional excavations by Marc Navarrete soon revealed the left foreleg, scapula, humerus, and ulna and, near the superior margin of the scapula, again in the undisturbed clay, a second projectile point came to light.

The excavations herein reported were made from April 14 to 18, 1952, with the following persons participating: Ernst Antevs, whose analysis of the geology accompanies this report; John Lance, paleontologist, Department of Geology, University of Arizona, whose report is also related hereto; E. B. Sayles, Curator of the Arizona State Museum; Garland Marrs, Alan Olson, George Cattanach, and Hayden Russell, students in the Department of Anthropology; and the writer.

The exemplary attitude and the alertness of the Navarretes shine as a beacon on the relationship between the interested amateur and the specialist. It is my sincere hope that the vital part these men have played in adding to a clearer understanding of Early Man in the Southwest will be a lasting satisfaction to them. Special acknowledgment is also made to Reid Gardner, then President of the Arizona Edison Company (now the Arizona Public Service Company) for having expedited the permit to excavate on company property.

The digging procedure was as follows: a) removal of recent surface deposits and outlining the extent of prior excavations; b) removal of overburden to bone layer and delimiting the extent of the bone deposit; c) exposure of all bones; d) preparation of elements and sections for preservation by jacketing. All steps were given adequate photographic coverage.

TOPOGRAPHY

The San Pedro River rises in northern Sonora, Mexico, flowing through southeastern Arizona in a northwesterly direction where it eventually joins the Gila River. The San Pedro Valley along its entire course is narrow, bordered on each side by mountain chains, and falls from 4275 feet above sea level at the international boundary to about 1900 feet at its juncture with the Gila. The upper basin, extending from Benson southward, contains extensive deposits of Pleistocene and Pliocene Age. Recent alluvium in the valley's axis is quite deep, quickly deposited and quickly eroded because of the steep gradient. Fossil remains are found chiefly in the older alluvial deposits along the edges of the inner valley and away from it in tributaries.

* A popular illustrated account of the Naco mammoth appears in the *Kiva*, Vol. 18, Nos. 3-4, 1952, published by the Arizona Archaeological and Historical Society, Arizona State Museum, Tucson.

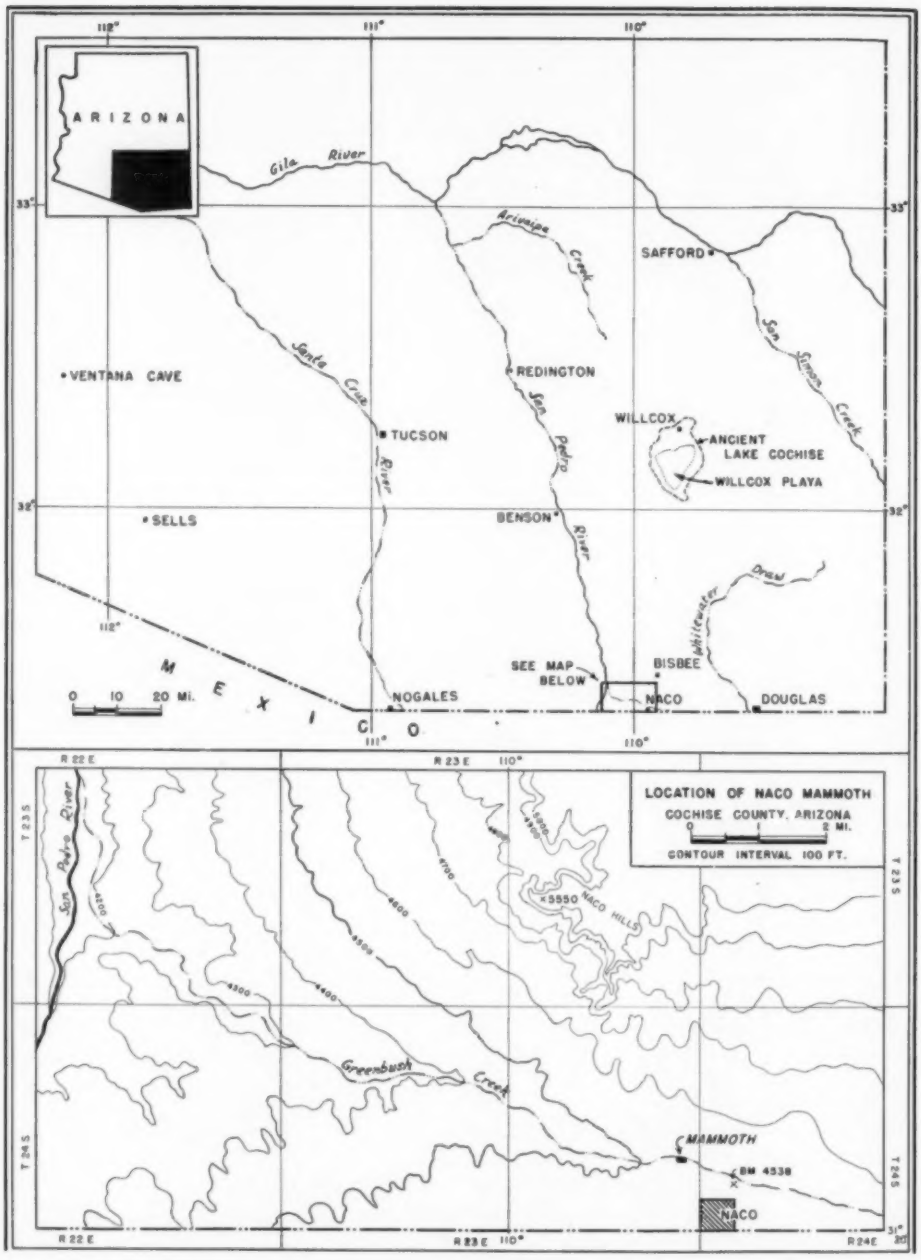

FIG. 1. General map of southeastern Arizona and enlargement of Naco area, giving location of mammoth station.

Greenbush Creek is one of these. It rises almost parallel to the Mexican border about seven miles due south of Bisbee near the southern tip of the Mule Mountains, extending west by north for twelve miles where it empties into the San Pedro River (Fig. 1). The elephant locality is a little over nine air miles from the river.

This drainage has an average fall of about 30 feet per mile. The flood plain, beginning a mile east of Naco, gradually widens to one-half mile or so at the lower end. Until a few decades ago the valley floor was heavily grassed and locally quite marshy. The erosion of the San Pedro channel, which began in 1883 (Bryan, 1925, p. 342), extended into the tributary systems and by 1922, headward cutting in Greenbush Creek reached a point north of Naco. This exposed the fossil-producing beds. The mammoth locality is one mile north by west of Naco on the south bank of the draw at an elevation of 4515 feet above the sea (Cochise County, R23E, T24S, S13, NE¼; Arizona State Museum Survey No.: Arizona FF:9:1). At this point the arroyo has a depth of 3 meters and a width of 12 to 15 meters (Fig. 2, *a*).

Occurrence of Bones

The San Pedro Valley has long been known as a fertile source of paleontological material. In the 1920's Gidley removed an extensive fauna from upper Pliocene and Pleistocene beds near Benson (Gidley, 1922, 1926; Gazin, 1942); the territory north of Redington has been a productive hunting ground for camel and other remains of Pliocene age. Elephant bones, stray elements and otherwise, have frequently come to notice, especially in the middle and upper reaches of the drainage. The discovery of these has been hastened by the accelerated erosion of the beds of the main stream and its tributaries. This is mentioned only to point out the fact that the San Pedro Valley, which has already contributed information on the late stage of the Cochise culture (Sayles and Antevs, 1941, pp. 21-26) may be expected to continue to yield information of early man. It would be folly to believe that the Naco elephant was the only such evidence.

At the start of the excavations, the only bones known were a few scattered elements at the edge of the arroyo lightly covered with sand and gravel and some 3 meters from the arroyo bank. The space between the gravelly arroyo floor and the bank sloped gently upwards towards the bank and consisted of laminated silts and clays and a thin blanket of drift material (Fig. 3, bed *e* and *supra*). The laminated clay-silt bed, being somewhat more resistant to erosion than the softer overlying deposits, remained as a bench (Fig. 2, *b*).

The removal of bed *e* revealed the fact that the bones were encased in it but rested on, and in the case of the larger elements, somewhat pressed into, the underlying sand layer *d* (Fig. 3). Locally among the bones there were small sandy lenses, evidently the result of current action which brought coarse material into the pond from higher parts of the sand bar. Over most of the area, however, the clay-sand cleavage was sharp. The position of the bones on the sand and the nature of the matrix makes it clear that the animal fell on the sandy surface and had not become mired. Lance has identified the animal as a Columbian mammoth, *Mammuthus* (*Parelephas*) *columbi* (see p. 19).

Insofar as revealed by our excavations, the bones were scattered over an area of approximately 7 meters east-west by 4 meters north-south (Fig. 3). The lowering of the arroyo bed below the bone level along the northeastern margin may have removed some of the elements. The larger bones, as skull, jaw and tusk, fore limbs, scapulae, ribs and vertebrae, were fairly well concentrated though disarticulated. The smaller foot bones were scattered as shown, the most distant ones being downward on what was then the gently sloping surface of a sand bar. The hind legs, pelvic girdle and lumbar vertebrae were not recovered, having either been carted away by the hunters when the animal was butchered, or washed away by the recent erosion. The latter possibility could only have taken place if these bones had become quite widely scattered from the rest, placing them in the present arroyo's path.

The bones rested on a sand deposit (bed *d*) which sloped uniformly over the area exposed with an east-west strike and a constant dip of 90° to the north. This slope in itself may account in part for the disarticulation of the bones, but the occurrence of the lower jaw up-slope from the skull, which may be presumed to have been near its original position when the animal fell, suggests that other agencies as predators, possibly Man, also dragged

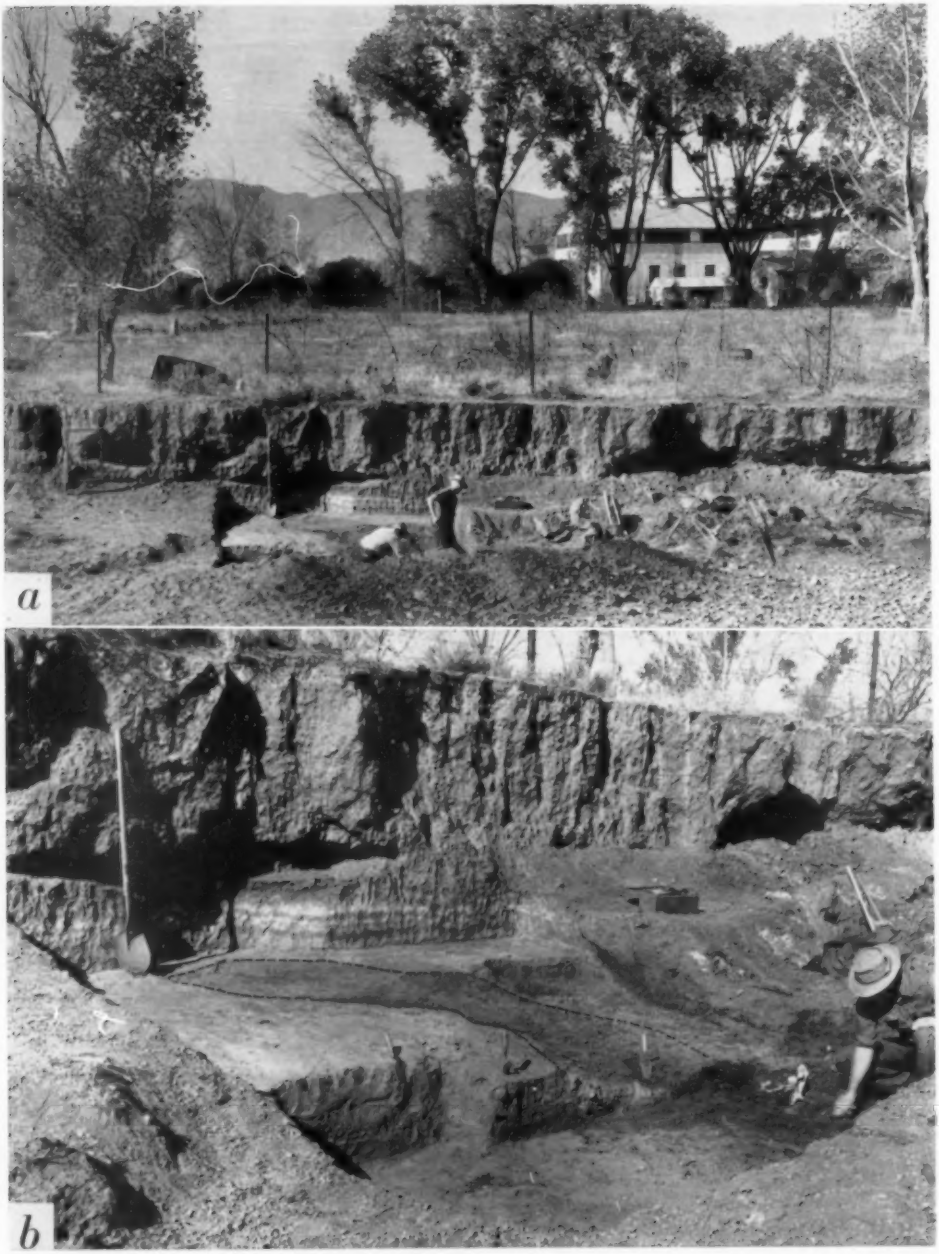

FIG. 2. *a*, The mammoth locality (Arizona FF:9:1) on Greenbush Creek one mile northwest of Naco, Arizona. Arizona Public Service Company plant in background. *b*, Laminated clay-silt bed (*e*) in base of which mammoth bones occurred. Trowels mark locations of bones encountered early in excavations and dotted line indicates extent of Navarrete excavation.

some of the bones about. The ribs and cervical vertebrae, though jumbled, were well concentrated (Fig. 4).

We may visualize the sequence of events leading to the preservation of these bones, somewhat as follows: killing of the animal, slaughtering, decay of remaining tissues, scattering of bones, and within a few years, the ponding of the adjacent stream providing the conditions for the formation of the clays which preserved them. That this took place within a few years of the death of the animal is indicated by the good preservation of the delicate parts of the bones. It may also be inferred that between the time of the "kill" and nature's burial of it, man did not revisit the spot, for it would appear likely that the spear points would have been retrieved. Several of these most certainly must have lain in plain view.

POINTS

Table 1 presents the essential characteristics of the eight points associated with the mammoth and one found in the arroyo upstream. Excluding the latter, we have in these a remarkable sample of undamaged projectile points, found *in situ* and used in the killing of a single large mammal. Their chief value lies in demonstrating what variations may be expected in contemporaneous weapons. While the Arizona State Museum actually removed but five of the eight points from their original spots, there is no reason whatsoever to doubt that the remaining three, two of which were taken out by the Navarretes and one by us in disturbed ground, were hurled on spears at the same time and by the same hunters as the others. The eight points will be regarded as a single association. Leaving the weapons in the cadaver seems a wasteful procedure in our eyes. But the task of searching for them in the butchering process must have been regarded as not worthwhile. I do not believe the wounded animal escaped the hunters and died far from the scene of the attack.

The location of the points is given in Figure 3. No. 1 (A-11912) has been placed approximately but Fred Navarrete is positive in his

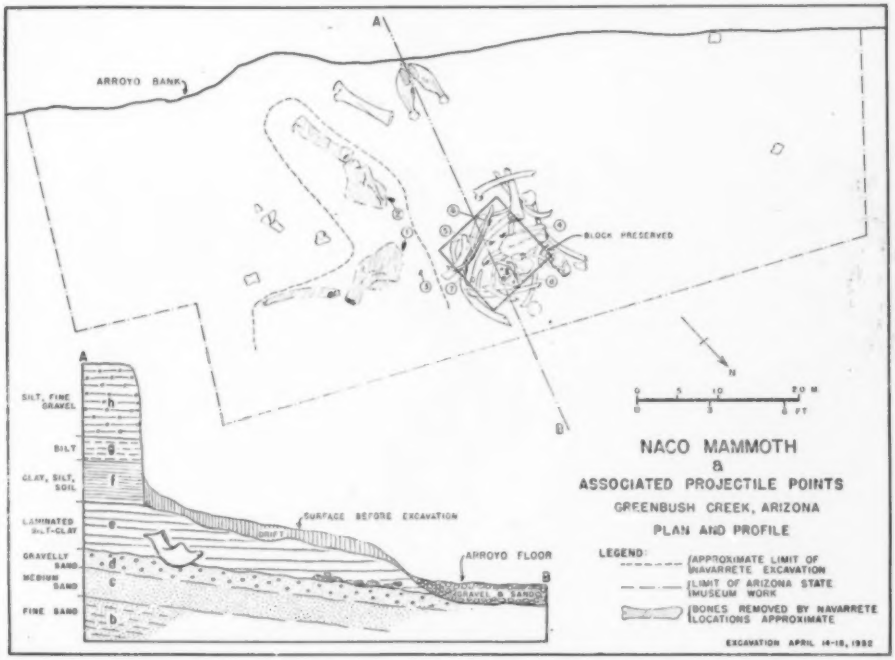

FIG. 3. Naco Mammoth station, showing the extent of the bone bed, location of spear points and the geology. Lettering of the deposits coincides with those assigned by Dr. Antevs (see following article). Enumeration of projectile points is in order of discovery; location of points 1 and 2 approximate only.

FIG. 4. General view of mammoth bones in early stage of uncovery. Lower jaw, center; ribs and vertebrae, foreground.

statements that the specimen was at the base or nuchal area of the skull. The position of No. 2 (A-11913) in relation to the left scapula has been established on the basis of a kodachrome slide in possession of Marc Navarrete. The rest were plotted during our work. No. 3 (A-10904) must have lain originally within the area excavated by the Navarretes, but exactly where, is not known. Nos. 4, 5, 6, 7, and 8 (A-10899, A-10902, A-10901, A-10903, and A-10900) rested among, between, and on bones in a meter-square area but none was imbedded in bone (Fig. 5). Nos. 6 and 7 were lying flat and wedged between ribs and No. 8 rested squarely against one of the anterior articular facets of the atlas vertebra. This occurrence is strikingly like the spear and atlas vertebra of a mammoth reported by Sellards (1938, Pl. 1) from Roberts County, Texas. Assuming that there was little or no shifting of the points since the death of the animals, the angle and place of penetration was about the same in each case, from the upper right side of the elephants and at the base of the skull, the spot in the elephant's anatomy where the spinal cord was most vulnerable. In the case of the Naco mammoth, this spear might have been the disabling one. It is worth noting that all the points recovered at Naco were between the skull base and fore part of the rib cage.

If the projectile point-bone association of itself is not convincing of contemporaneity, the concentration of the points in the vital target area of an animal should dispel any doubts. It may also be inferred that these were weapons and not knives used in butchering the animal. Tools used in the dismembering process were not recovered. The recent evidence from Mexico (Aveleyra and Maldonado-Koerdell, 1952) suggests that small cutting tools were employed in the slaughtering of the mammoth at Iztapan.

The materials used in the manufacture of the Naco points are of two classes, chert and felsite (identification by Richard T. Moore, Assistant Mineralogist, Arizona Bureau of Mines). The chert varies in color from dusky red through browns to gray and shows some banding and mottling. The felsite, dark gray in color, is exceptionally homogeneous and well suited for pressure chipping.

The interesting observation may be made that three pairs of points were made of the same stone: 6 and 8, dark gray felsite (Figs. 6 and 7, *g, h*); 1 and 3, dusky red chert (Figs. 6 and 7, *a, d*); and 4 and 7, brown chert (Figs. 6 and 7, *b, e*). This indicates that materials were obtained in good-sized chunks and that the source of supply was quite adequate. Where that source was is impossible to say now, although it should be noted that both limestone, the probable source of the chert, and volcanics, the source of the felsite, occur locally. There is no patination evident in the specimens.

Figures 6 and 7 illustrate the eight points, obverse and reverse. Even including the smallest point in the series, 3, (*a*) both maximum and basal widths are quite uniform. These range from 23 to 34 mm. and 19 to 27 mm. respectively. The lengths show a far greater range, from 58 mm. (3, Figs. 6 and 7, *a*) to 116 mm. (7, Figs. 6 and 7, *e*). Six of the points range between 68 and 97 mm. which, as far as this sample is concerned, appear to best express the normal size. It is important, however, to recognize the smallest (3) and the largest (7) specimens as emphasizing the lack of standardization in length of this kind of projectile. This size range sounds a note of caution to the taxonomist who would use length as a rigid criterion. It also makes clear that the largest of animals known to ancient hunters were not always hunted with only the largest tips on their spears.

FIG. 5. Meter-square block of ribs, vertebrae, and scapula, showing locations of 5 spear points. This block was jacketed and removed intact to the Arizona State Museum.

FIG. 6. The eight points recovered among the bones of the Naco mammoth. *a*, No. 3(A-10904); *b*, No. 4(A-10899); *c*, No. 5(A-10902); *d*, No. 1(A-11912); *e*, No. 7(A-10903); *f*, No. 2(A-11913); *g*, No. 6(A-10901); *h*, No. 8(A-10900). Length of *e*, 116 mm.

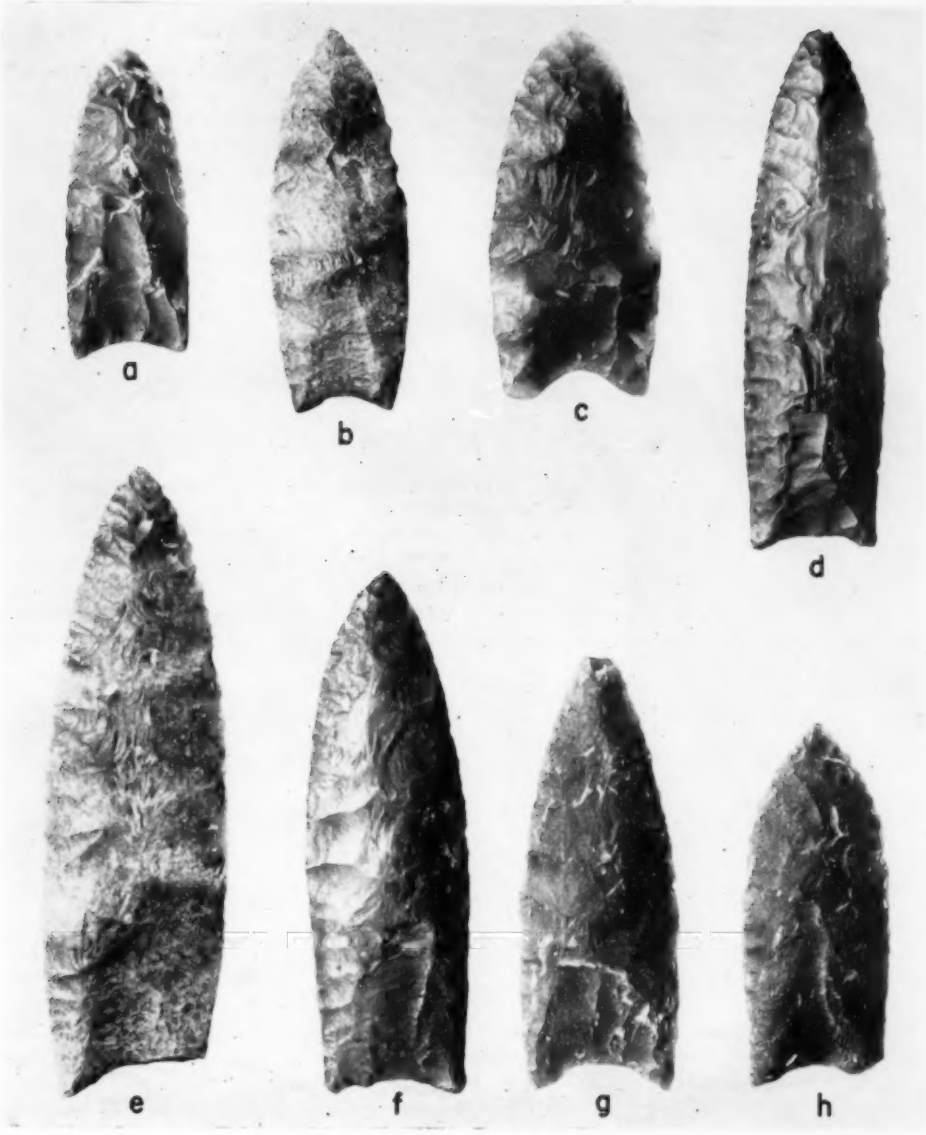

FIG. 7. The Naco points, reverse faces.

TABLE 1. NACO PROJECTILE POINTS.

(Measurements in millimeters; color references to Munsell Soil Color Charts, Hues 7.5R through 5Y)

ASM Cat. No.	Figs. 6 & 7	Location Fig. 3	Material and Color	Total length	Max. width	Basal width	Max. thick.	Extent of dull edges above base	Remarks
A-11912	d	Near nuchal area of skull No. 1	Chert; dusky red, 10R, 3/2 to 10R, 2/1; reddish black near tip and base	96	25	23	9	32	Found by Fred Navarrete Aug. 1951. Pronounced median ridge both faces. Same material as No. A-10904
A-11913	f	About 10 cm. from superior margin of left scapula; point towards bone, No. 2	Chert: reddish gray, 5YR, 5/2 to dark gray, 5YR, 4/1. Some mottling	97	30	27	9.5	35	Found by Marc Navarrete Sept. 1951
A-10899	b	In rib area. No. 4	Chert; dark brown, 7.5YR, 1/2 grading to brown, 10YR, 5/3. Banded	72	26	19	8	31	Same material as No. A-10903
A-10900	h	On anterior articular facet of atlas vertebra. No. 8	Felsite; very dark gray, 2.5 YR, 3/0	68	27	27	8	35	One ear broken. Same material as A-10901
A-10901	g	Between overlapping ribs. No. 6	Felsite; very dark gray, 2.5 YR, 3/0	81	30	27	8	35	Fluting by multiple flaking. About 3mm. lost at tip, not included in measurement. Same material as A-10900
A-10902	c	In rib area. No. 5	Chert; dark gray, 2.5YR, 4/0 grading to very dark gray, 2.5YR, 3/0. Banded, translucent at edges	68	31	27	8	30	Ears rounded. Poorest workmanship.
A-10903	e	Between and in contact with overlapping ribs. No. 7	Chert; gray, 10YR, 4/1 to light brownish gray, 10YR, 6/2. Mottled	116	34	27	9.5	36	One ear broken. Same material as No. A-10899
A-10904	a	In back dirt, Navarrete excavation. No. 3	Chert; dusky red, 10R, 3/2	58	23	22	7.5	28	Same material as A-11912
A-11914	Fig. 8	In arroyo ¼ mile upstream from elephant locality	Chert; gray, 10YR, 6/1	81.5	32	30	10	32	Large horizontal flakes, fine edge retouching

Without exception the place of maximum width is at the approximate mid-point of the blade. Edges curve gently from the point baseward except in 1, 2, and 8 (Figs. 6 and 7, *d*, *f*, and *h*) which show slight recurving near the bases.

Bases are concave in all specimens, ranging from 2 to 5 mm. in depth.

The flaking on all points may be classed as horizontal to irregular with high variability in flake size. One and 7 (Figs. 6 and 7, *d*, *e*) best illustrate the horizontal arrangement of the flake scars. The techniques of collateral and oblique parallel flaking, commonly associated with early chipped tools, are not represented at all. Fine edge retouching generally is lacking though locally it occurs in an apparent effort to bring the edges to more perfect symmetry. The irregularity of the flaking did not lead to the formation of a median range, except in 1, and, as a consequence, its section is lozenge-shaped.

Fluting occurs on both faces of all points. This was done by removing usually one large flake from the base pointwards and occasional small flakes. A good example of multiple flakes is seen in 6 (Figs. 6 and 7, *g*). The length of the fluting varies from one-fourth to one-half the length of the point.

Ground edges are consistently present. Evidently this was done to prevent cutting of the hafting materials by what otherwise would have been sharp edges. The dulling includes the concave base and the edges from the base upwards for about one-third to one-half the total length of the point. There is close correlation between length of fluting and extent of edge smoothing which reflects, in my opinion, the functional relationship of these two characteristics.

Reference was made above to the fact that in three instances 2 points were manufactured from the same stone. In actual workmanship, there is a striking similarity in all points, yet it is probable that those pairs of identical materials were produced by the same craftsman. If this inference is allowed, it becomes evident that one individual made points as variable in size as 1 and 3 (Figs. 6 and 7, *a*, *d*) and in shape as 6 and 8 (Figs. 6 and 7, *g*, *h*).

Additional Discoveries

Some years prior to the discovery of the Naco elephant, Marc Navarrete picked up a fluted point in the arroyo bed of Greenbush Creek about one-quarter mile above the elephant locality. Made of gray flint, it measures 81.5 mm. in length, 32 mm. in width and 10 mm. in greatest thickness. In all characteristics, form, size, chipping, basal thinning, dulled edges at base (Fig. 8), it agrees with the projectiles recovered among the bones of the elephant and may also be labelled as of the Clovis Fluted type. Evidently eroded from some buried resting place, this point hints at a wider distribution of the type than is indicated by the elephant locality.

About 25 miles northeast of Benson (Fig. 1) between the headwaters of Arivaipa Creek on the north and Whitewater Creek on the south, lies a land-locked basin where, in past times, waters collected to form a lake covering approximately 120 square miles (Meinzer and Kelton, 1913, p. 34). The Willcox Playa, a salt flat, is the modern inner remnant of the old lake floor of pluvial Lake Cochise. Well developed gravel beaches, especially on the west and south sides, testify to the former extent and permanency of the lake. Antevs regards the most recent maximum stand of the lake to have been during the last pluvial (Sayles and Antevs, 1941, p. 33).

Sayles and Antevs during their studies of the Cochise culture and representatives of the Arizona State Museum have, on numerous occasions, found traces of human occupation on the old beaches. While much of this has been surface evidence, extensive workings of the

Fig. 8. Clovis Fluted point from Greenbush arroyo floor. Lateral lines indicate extent above base of dulled edges. Length, 81.5 mm. (Drawing by Barton Wright)

beaches for highway ballast and a few shallow erosion channels have revealed lithic materials well within the beach gravels also. Most of the specimens have been the tools of the Cochise culture, notably those designed for grinding. The head of a human femur, heavily mineralized was recovered from a gravel pit (Ariz. CC:13:3, Arizona State Museum Survey) in the southwestern beach by the Arizona State Museum. Shore deposits are also known to contain vertebrate fossil remains (Bryan and Gidley, 1926).

In November, 1952, one of the gravel pits (Ariz. CC:13:5) was revisited and in the course of examining the standing profile of the pit, a projectile point was found *in situ* at a depth of .9 m. in the highest part of the beach (Fig. 9). It rested horizontally on one of its flat faces among the uncemented beach pebbles which, at this level, are in a liberal dirt matrix. The point, of opaque lusterless obsidian, is 40 mm. in length and 24 mm. in width. The chipping is of an inferior quality (Fig. 10) and the edges are not ground. Basal thinning has been attempted. Grinding stones and several stone chips, though not formalized tools, were observed close by and at about the same depth.

Fig. 9. Profile of gravel pit in Lake Cochise beach, showing projectile point (Fig. 10) *in situ* at depth of .9 m. (circled). Other object is a stone chip.

Reference is made to these occurrences here for two reasons: first, that the Willcox Playa area holds promise to early man studies and has up to now been quite neglected, and second, that the point in particular may be drawn into the consideration of the Naco points. Since, in an exposure of several hundred meters in this gravel pit, there is no evidence of downward artificial penetrations into the gravels, I believe that the specimens are in a true geological context. If this is the case the cultural items would have been lost or strewn on the beach surface, *before* the climax of beach-building was reached, for nearly a meter of depth was added before the lake receded. This would place the time as within the last pluvial or in excess of 10,000 years ago, and roughly the equivalent in time of the Naco elephant.

Typologically the Lake Cochise point cannot be classified as a Clovis Fluted, but we wonder if it is not within the expectable range of that type which certainly would have included some of inferior quality. Its association with grinding stones introduces the timely question of the relationship between the gathering economy of the Cochise culture and the hunting economy reflected by the Clovis Fluted projectiles. More will be said about this later.

Discussion

Typological placement of the Naco projectiles, including the one from the arroyo, presents no serious problem. All manifest a high degree of regularity except in length and the

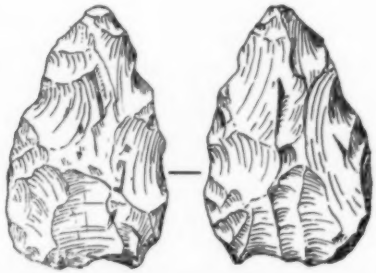

Fig. 10. Point from beach gravels, pluvial Lake Cochise. Actual size.

norms thus set closely agree with the characteristics of the type now known as the Clovis Fluted. Sellards (1952, p. 38) accepts this identification as do Roberts, Krieger, and Wormington (personal communications). Only the smallest one in the lot (3) has been questioned. *If found alone*, it probably would not have been classed as a Clovis Fluted. Identification of single specimens has often been difficult, but in this case where eight occurred in one animal, its inclusion in the type is inescapable. The value of the sample lies in the size variation it reveals and we have a suggestion in it that our concept of the type may be too narrow.

In other places where Clovis Fluted points have been found in association with faunal remains the animals represented are elephants. The evidence for this has been summed up in Sellards, recent book (1952, pp. 17-46). The tools of the elephant hunters, imperfectly known as to typological range, he calls the Llano complex and the makers of them Llano Man. The name is derived from the Llano Estacado or Staked Plains of New Mexico and Texas, for it is in this region that the principal discoveries of elephant kills have been made. The Naco station extends the area of distribution of Clovis Fluted points farther to the south and west than heretofore known and the Iztapan mammoth (Martinez del Rio, 1952; Aveleyra and Maldonado-Koerdell, 1952) in the Valley of Mexico greatly extended the range of elephant hunters southward.

Since the Naco station has provided us with but a single type of tool, we can view the early hunters only through the narrow objective thus provided. The presence of Llano Man in the part of the Southwest is attested by them but we are still in the dark about him personally or about other aspects of his culture.

Two problems, however, may be discussed briefly. The first of these concerns the age; the second, the Cochise culture-Llano Man relationship.

Antevs, on geological grounds, has assigned the age of the bone deposit to a period between 10,000 and 11,000 years ago. We have, as yet, no supporting radiocarbon dates. Elsewhere, the occurrence of Clovis Fluted points with mammoth, the geological contexts, and the wide dispersion of the type, hint at a respectable age. For the Clovis, New Mexico, sites Antevs holds the Clovis formation "to be at most 13,000 and at least 10,000 years old" (with Wormington, 1949, pp. 190). Krieger, in his recent summary of New World culture history (1953, p. 241) states that "Clovis points are somewhat older than 11,000 years, possibly as much as 15,000 to 18,000 years." Even though our dating methods today still lack explicitness, the historical position of the Naco weapons appears to be early in the predictable range. In my opinion, the Naco "kill" was older than the oldest cultural horizon in Ventana Cave with a minimum date of 10,000 (Bryan, with Haury, 1950, pp. 125-126), and that both of these were anterior to the Sulphur Spring Stage of the Cochise culture, dated by climatic history to more than 10,000 years ago (Sayles and Antevs, 1941, p. 55) and by radiocarbon means to 7756 ± 370 (Libby, 1952, p. 84). Whether this is early or late in the life of the stage is not known.

This brings us to the question of the relationship of Llano Man—the hunter—and Cochise Man — the collector. Our knowledge of the Cochise culture has come chiefly from buried campsites along old streams and bogs where grinding stones, used in food preparation, have been found literally by the ton. In the earliest stage, the Sulphur Spring, chipped tools and, most of all, projectile points, are rare to absent. Subsequently during the Chiricahua and San Pedro Stages and especially the latter, flaked tools appear in abundance.

Three possibilities suggest themselves: first, that from the start, the area of greatest concentration of Cochise culture sites, southeastern Arizona, was inhabited by collectors, and that the Naco points signal an intrusion into their territory by the Llano hunter. Second, that historically, the hunters were here first and that in response to changing environment which set in at the end of the last pluvial, the economic dependence of these people gradually shifted to include gathering along with hunting. Third, the Llano hunter and the Cochise collector were one and the same from the beginning and that the strikingly different tool assemblages are related to seasonally differing food sources and habits — winter hunting and summer gathering.

In terms of what little data we have for the western United States, I favor the second of these possibilities not ignoring, however, the third as part of the problem, too. In the Plains, grinding tools are not included in the Llano

complex though the age is high. So far, diligent search in the Greenbush Creek has produced no grinding stones, suggesting that if any camps were nearby, they were those of hunters. In the Ventana complex (Haury and others, 1950, pp. 176-199) there was but one grinding tool in a sample of ninety specimens. In higher and later deposits they were present by the hundreds. Hence, the inference drawn above. If the point from the ancient Lake Cochise beach, previously noted, is as old as it appears to be, the coexistence of the two tool types is apparent, although in accordance with this reconstruction, the time would have been somewhat later than the Naco discovery.

Conclusions

From the foregoing observations, and including also those of Antevs and Lance, the following conclusions may be drawn:

1) Prior to 10,000 years ago, during the last pluvial maximum, a Columbian mammoth (*Mammuthus* (*Parelephas*) *columbi*) was killed by hunters who hurled no less than eight stone tipped spears into it. The locality was in what we know today as the San Pedro Valley in southern Arizona.

2) The animal fell on a sand bar adjoining a stream and what remained of the carcass after the hunters had salvaged the parts they wanted was soon covered by a succession of deposits which register the subsequent climatic history of the region.

3) Though variable in size, the spear points were all of one kind, called by students of early man the Clovis Fluted type. These are almost identical with others found to the east and northeast in the Plains, thereby extending the known distribution well to the west.

4) The relationship of the Llano complex of which these points are but one element and the Cochise culture remains to be determined but they undoubtedly represent a hunting antecedent of the latter.

ARTIFACTS WITH MAMMOTH REMAINS, NACO, ARIZONA

II. Age of the Clovis Fluted Points with the Naco Mammoth

ERNST ANTEVS

BED SERIES WITH MAMMOTH AND PROJECTILE POINTS

THE CLOVIS FLUTED projectile points occurred about 2.1 m. below the ground surface, among the skeletal remains of the mammoth on top of a rust-colored pebbly sand (Fig. 11, bed *d*). This gravelly sand, 0.15 m. thick, is underlaid by 0.3 m. of red-brown medium sand (*c*), and this in turn by more than 0.3 m. of rusty fine sand (*b*). The sands (*b,c,d,*) were deposited by a stream which was essentially perennial. The mammoth fell in the stream channel 12.0 m. from the north bank, the only one observed. As the carcass became defleshed the stream was dammed, for the sediments between the bones is almost wholly pond clay of bed *e*. It was these coincidental events which preserved the bones. The south bank is not exposed and perhaps not preserved.

The stream-laid beds rest on eroded gravel (*a*), here named gravel number 1. This gravel is medium coarse and is gray to brownish gray at top, red to redbrown at the depth of about a meter. The base was not seen, but at one point the observed bed is more than 3.0 m. thick. The gravel was also observed 30.0 m. east of the site and at some places to the west.

The mammoth skeleton and the points were buried by a bed (*e*), 0.55 m. to more thick, of alternating laminae of almost white silt (sandy in parts of section), and of dark gray clay. This laminated deposit was formed in a pond, dammed perhaps by beaver. The succeeding layer (*f*), 0.45 m. thick, is dark brown in color and consists of a mixture of clay, silt, and soil. The soil was in part washed in, in part formed *in situ*. The bed shows that the site had changed to a wet meadow or cienega. The overlying beds, 0.25 m. of graybrown silt (*g*) and 1.0 m. of a light brown mixture of silt and fine gravel (*h*), are channel and floodplain deposits and indicate a continued drying of the climate and impoverishment of the plant cover. The profile thus records an unbroken gradual change from a relatively moist climate with permanent stream and pond to a dry one during which dry-climate arroyo cutting possibly began in the region, though not exactly at the site. It denotes a change from a dry subhumid to an arid climate, according to the classification of Thornthwaite (1948, Pl. 1).

Later events did not affect the very site, except perhaps the top bed, until the modern arroyo erosion set in several decades ago.

THREE YOUNGER BED SERIES AND RECORDED CLIMATIC HISTORY

However, since the top bed at the mammoth and artifact site was deposited in part or in full, repeated arroyo cutting and filling has taken place in the immediate neighborhood. This is recorded in the walls of the modern arroyo of Greenbush Creek, which have been studied from one mile east to one-half mile west of the site. The arroyo is 3.0-4.5 m. deep and 15.0-30.0 m. wide.

The stratigraphic succession, as interpreted, is shown in Figure 12. The main basis for cor-

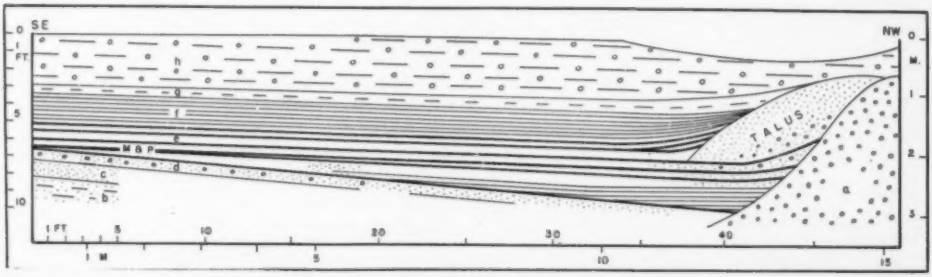

FIG. 11. Bed series at Naco mammoth station. Mammoth and Clovis Fluted points occurred on top of layer *d*, at "M&P" near left side of section.

relation and division is supplied by gravel beds which in the largely semiarid Southwest record poor or impoverished vegetation, that is, in the past, dry ages (Antevs, 1952b, pp. 381-84). Gravels are residues of arroyo cutting; materials not flushed out of the channels.

Three separate gravel beds, younger than the mammoth and projectile points, have been distinguished. They are here numbered 2-4.

Gravel 2 (*i*) is fine to medium coarse, gray, cemented, and .6-1.2 m. thick. It was seen at several places between the site and a point 120.0 m. east of the road which crosses the arroyo about one-half mile east of the site. Its stratigraphic position is given by its local occurrence on eroded surfaces of rusty pebbly sand, identical with that just below the artifacts (*d*).

Gravel 3 (*l*) is silty and cobbly, brown to redbrown, and 1.5-2.4 m. thick. It is common in the walls in the eastern part of the arroyo and disappears south of it 30.0 m. east of the road crossing. It is probably this gravel which shows in the tributary arroyo one-third mile west of the site. In the south arroyo wall 75.0 m. east of the road crossing this gravel is underlaid by an eroded light gray silt (*j*) which in turn overlies gravel number 2, 45.0 m. farther east.

Gravel 4 (*p*) is locally cobbly, mainly gray, and 0.15-1.8 m. thick. It is well represented in the north wall at the road crossing, but wedges out 50.0 m. to the east. The bed crosses the modern arroyo to the south wall 30.0 m. west of the road and is then visible in this wall at several places. The gravel rests on an eroded brown silt, which seems to be identical with that (*m*) directly overlying gravel number 3, 90.0 m. to east of the road.

Gravel 2 (*i*) is directly overlaid by a silt, which is mostly pebbly but locally clayey (*j*). The silt bed is 0.45-1.2 m. thick. It is mostly dark gray, but in the lower part frequently blue, bluish or whitish. This bed is in turn overlaid by a brown or graybrown silt, 1.2 m. thick, which in places is pebbly (*k*). At three places the lower bed occurs in depressions in the gravel, and at one of them it contains a stringer of gravel, 0.45 m. thick. In these instances the silt and clay may have settled in small basins in the arroyo floor from muddy water left after arroyo runs, that is, they may be charco deposits (Antevs, 1952b, p. 381). However, most of the lower silt and all of the upper may have been deposited among vegetation on the channel floor and, after the channel was filled, on the floodplain, when the climate was neither distinctly dry nor moist for the region.

The third gravel (*l*) is overlaid by 0.3-0.6 m. of brown silt (*m*), and this is in one place superimposed by a dark brown mixture of clay and soil, a cienega deposit, 0.3 m. thick (*n*). However, this meadow formation can postdate gravel 4.

The fourth gravel (*p*) is at several observed places overlaid by a dark brown cienega bed, 0.15-0.75 m. thick (*q*), and this is followed by a brown silt, 0.3-0.6 m. thick, which at most places forms the present ground surface (*r*). Where the cienega deposit is absent, the brown silt rests directly on the gravel.

These series of beds can be, and probably are, incomplete for several reasons. Some beds had originally small extent. Some were partly or largely cut away by erosion. Some, though

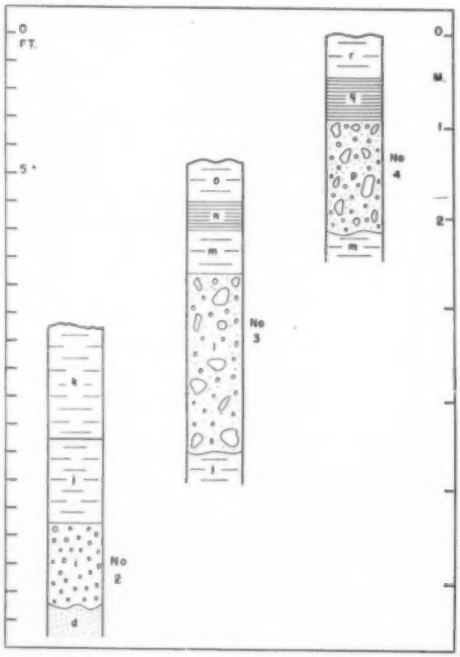

FIG. 12. Three series of beds exposed in arroyo walls of Greenbush Creek and their correlation. All beds except *d* are younger than those at the mammoth station.

present, need not show up in the present arroyo walls which display only a small portion of the old fills.

Gravels 2, 3, and 4 together with the intercalated fine-grained beds thus record three cycles of moisture with a range from arid to semiarid in Thornthwaite's scale. The modern arroyo cutting does not record a dry age, but was caused by overgrazing and white man's activities (Antevs, 1952b, p. 384). Since no cienega bed was observed from the cycle initiated by gravel number 2, though its silts are abundantly exposed, this cycle probably did not attain a relatively moist meadow stage.

No fossils or artifacts, which might help to date these deposits, have been found. However, the thickest and most extensive gravel bed, 3, may derive from the distinctly warmer and drier age, the Altithermal-Long Drought, which prevailed about 5000-2000 B.C. (Antevs, 1952a, p. 23). Gravel 4 may date from the San Pedro drought, so named because its lowest arroyo beds contain the earliest full assemblage of San Pedro artifacts in the Sulphur Spring Valley, Arizona. This drought seems to have occurred about 1000 B.C. (Antevs with Wormington, 1949, p. 90).

Gravel 2 has not been recognized previously. It can derive from the early part of the Altithermal, which in that case would have been climatically more complex than now held. Or it can represent a dry interlude during the general moisture decrease during the preceding Anathermal. Existing data do not indicate which alternative prevailed. It deserves mention that Morrison (1952) in Nevada sees evidence for a post-Lake Lahontan low lake stage followed by a pre-Altithermal rise.

Thus the beds of cycles 2, 3, and 4 represent the Altithermal and Medithermal ages, i.e. the last 7000 years, and possibly also part of the preceding Anathermal age.

Mammoth and Projectile Points from Last Pluvial Maximum

Two lines of evidence help to date the rusty pebbly sand (*d*) below the mammoth and the Clovis Fluted points. Since the sand was stream-laid and the overlying laminated bed (*e*) was deposited in a pond, both record a moisture maximum and indicate a moister climate than, as far as known, has prevailed during the past 8000 or 9000 years. The three younger series of deposits (Fig. 12) show that the mammoth and artifact bed really derives from the last pluvial. Bed *e*, mammoth, and points consequently date from the last pluvial culmination in the region.

This pluvial maximum, the Estancia, was probably a correlative of the cool Cochrane stage, named for Cochrane, Ontario, where the retreat of the ice sheet was repeatedly interrupted by ice readvances (Antevs, 1935; Antevs with Wormington, 1949, p. 190). The Cochrane stage is the natural correlative of the Salpausselkä stage (also called the Younger Dryas age) and of immediately preceding halts in Finland and Sweden, and it is by this correlation dated at 11,300-10,150 B.P. (Antevs, 1953). Leopold's (1951, p. 167; cf. p. 399) critique of this dating of the culmination of the Estancia pluvial is not based on any great difference between his results and mine. It grew solely out of his mistaken belief that I had assumed that the temperature during this pluvial culmination was higher than at present. On the contrary, I had clearly stated that the temperature must have been lower.

Therefore the mammoth skeleton and the Clovis Fluted points at Naco may be between 11,000 and 10,000 years old. The radiocarbon date of 9883 years of a burned bone (sample 558) from the Folsom level at Lubbock, Texas (Libby, 1952, p. 82), is in accord, for at Clovis, N.M., the Folsom point occurs in a higher stratigraphic horizon than does the Clovis Fluted point (Sellards, 1950).

FIG. 13. *Mammuthus columbi*, Naco, Arizona. Mandible, about ¼ natural size. Right ascending ramus broken off in laboratory. Left coronoid process broken and lost in collecting.

ARTIFACTS WITH MAMMOTH REMAINS, NACO, ARIZONA

III. Description of the Naco Mammoth

JOHN F. LANCE

FOSSIL REMAINS of a mammoth found near Naco, Arizona in 1951 are of considerable interest because of a demonstrable association with artifacts representing an early cultural stage of man in North America. Detailed accounts of the find and its archaeological implications by Haury, and of the geology and stratigraphy of the site by Antevs precede this article. A preliminary study of the fossil material indicates that the mammoth may probably be assigned to *Mammuthus (Parelephas) columbi* (Falconer).

Gratitude is expressed to Marc Navarrete and his father Fred Navarrete for permission to describe the upper teeth removed by them at the time of their original discovery, and to Emil W. Haury for making it possible for the author to participate in the study.

NATURE OF THE MATERIAL

Material available includes an essentially complete mandible with worn second molars and unerupted third molars, two worn second upper molars, one of which is broken, two broken but unworn upper third molars, and miscellaneous skeletal material, mostly fragmentary. A slab of matrix containing artifacts, a scapula, atlas, and rib and vertebral fragments was removed intact for museum display. The known position of material collected in 1952 by the Arizona State Museum party, and the inferred position of material collected in 1951 by the Navarretes is shown by Haury.

The bone is very friable and shows little or no alteration or permineralization. The mandible was complete except for the tip of the left condyle, destroyed in collecting, but shows numerous fractures and is somewhat distorted, as if by weight of overlying sediments.

All of the Naco mammoth material in the Arizona State Museum has been assigned the number P-88. The upper teeth and other material collected by the Navarettes is in the possession of Marc Navarette of Phoenix, Arizona.

DESCRIPTION OF MATERIAL

Lower Teeth and Mandible. The mandible (Figs. 13, 14, *d*) contains the second molars in a moderate stage of wear and unerupted third molars (Fig. 14, *a*). Only about the anterior twelve plates of the third molars are exposed, but the right ramus was broken during removal from the plaster cast, and a dissection of the bone revealed the full extent of the tooth on that side. Exact dimensions and details of the lower teeth cannot be ascertained without further damage to the specimen. Additional information may be obtained during final preparation.

The lower teeth are relatively narrow in the transverse direction, with moderately thin enamel, and moderately compressed ridge plates. The number of ridge plates in 100 mm. varies from 6 to 9 depending on the position of the count. The extreme-count of 9 was obtained only along the unworn surface of the left third molar. The count decreases toward the base in the portions exposed, and would probably be about 6½ if the third molars were moderately worn. Cement on the molars is relatively thin, averaging about 5 mm. in thickness on the second molars, and being present only on the anterior plates of the third molars. Estimated and measured dimensions of the lower teeth are given below in Table 2.

In lateral aspect the mandible is moderately elongated, with a high coronoid region (Fig. 13). The ascending ramus appears to incline slightly backward, but this may be caused by the distortion mentioned above. The mandible is by no means as long as that of primitive North American species such as M. *hayi* Barbour, but has more the general proportions of M. *nebrascensis* Osborn.

A pronounced feature of the mandible is a spout-like rostrum. A specimen described by Osborn as *Archidiskodon sonorensis* from Sonora, Mexico, has a very similar rostrum. However, the feature appears to be common in specimens assigned by Osborn to several other species, including his *Parelephas jeffersonii*.

Upper Teeth: The second left molar (Fig. 14, c) is the only upper tooth preserved intact. Enough loose plates can be fitted together to give a probable plate count for the third molars of about 18 to 20. The anterior end of left M^3 shows a worn surface corresponding with a similar surface at the back of M^2, but the crown shows no indication of having reached occlusion. In M^3 the plates are sinuous from top to bottom and show a slight convergence toward the summit (Fig. 14, *b*). A faint suggestion that the plates are set farther apart near mid-height of the crown is not confirmed by measurement, and the frequency count is uniformly near 7 plates per 100 mm. except at the base where it is 6½.

The upper teeth are relatively narrow. Cement on the sides of the second molars does not exceed 5 mm. in thickness, and is present on and between the first eight ridge plates only of the third molars.

Measurements: In Table 2 are given measurements of the teeth. Plate frequency counts are given as taken perpendicular to the plates. Antero-posterior lengths are taken along the occlusal surfaces of the worn second molars, estimated perpendicular to the plates of the upper third molars, and taken in a straight line from anterior to posterior margin on the strongly curved right lower third molar. Widths of teeth are maximum transverse measurements on enamel, exclusive of cement.

The mandible is possibly not fully grown, but is probably nearly so. The following measurements are given for comparison with [illegible] lished illustrations: distance from le[illegible]ie to tip of rostrum, 760 mm.; length from symphyseal groove to tip of rostrum, 140 mm.; depth of right ramus from alveolar border at front of M_3, 190 mm.; greatest transverse thickness of right ramus below front of M_3, 170 mm. Transversely the atlas is approximately 366 mm.

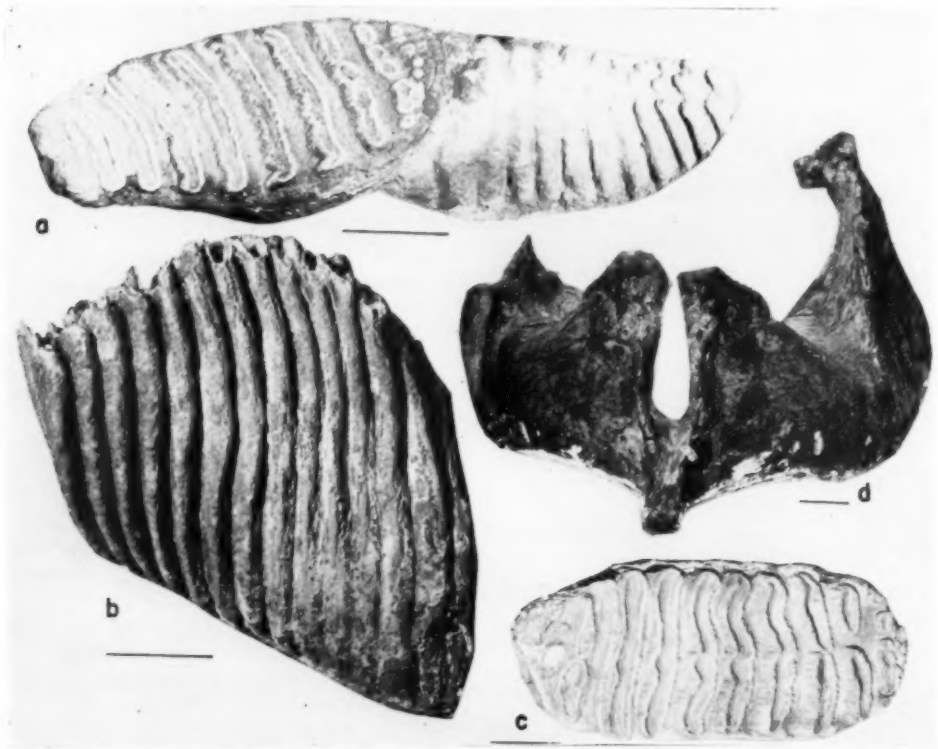

FIG. 14. *Mammuthus columbi*, mandible and teeth. Line under each figure represents 50 mm. *a*, Occlusal view of left M_2 and M_3; *b*, lingual view of left M^3; *c*, occlusal view of left M^2, anterior to left; *d*, anterior view of mandible.

TABLE 2. MEASUREMENTS OF TEETH IN MILLIMETERS

	M^2		M^3		M_2		M_3	
	R	L	R	L	R	L	R	L
Ant.-Post. length	135+	187	——	240e	203	196	245e	——
Greatest Width	83	81	87	85	80	78	86	——
Plates per 100 mm	6½–7	6½–7	6½–7	6½–7	5½–6	6	6½–8	8–9
No. of Plates	7–8+	10–11	18+	18–20e	10–11	10–11	17–18	13+
Max. Plate Height	114	137	224	228	——	——	145	——

DISCUSSION

Savage (1951, pp. 236-7) has recently discussed the difficulties involved in identifying isolated mammoth teeth. Most of the information available is summarized by Osborn (1942) in the second volume of his monumental work on the Proboscidea. The characteristics of the Naco mammoth fall within the general range exhibited by specimens assigned to *Mammuthus columbi* and M. *imperator*. Osborn discussed at length, in several publications, the distinctions between these two species, and he considered them as belonging to two different genera, *Parelephas* and *Archidiskodon*, both now frequently used as subgenera of *Mammuthus*.

A final summary of Osborn's views (1942, p. 1586) gives the following features as characteristic of M. *columbi*: "Smaller animal, with narrower grinders, thin cement outer coating; maximum ridge plate formula $M3 \frac{18–19}{15–16}$. Enamel ridge plates arcuate, converging at summit, giving the appearance in extremely worn grinding teeth of being as far apart in mid-section as in A. *imperator*." The ridge plate frequency is stated to be 5–6½ in 100 mm. as compared to 5–7 in M. (A.) *imperator*. The ridge plate formula of M. *imperator* for the third molars is given as 17–18 upper and 18–20 lower, and the plates are said to be widely separated.

An attempt to apply these characteristics to published descriptions of material assigned to both species suggests that there is still some confusion between them. The ridge plate formulas may be valid, but completely accurate counts can seldom be made, particularly without sectioning the teeth. In the case of a specimen in the growth stage of the Naco mammoth the posterior ridge plates would probably have increased in height and additional plates might have been added had the animal lived to full maturity. The formula for the third molars is probably most useful in distinguishing M. *imperator* and M. *columbi* from certain other species.

The plate-frequency range quoted above would suggest a greater plate compression for M. *imperator* in some instances (5–7 as opposed to 5–6½ for M. *columbi*), but the contrary is generally considered to be the case, and Osborn himself found a compression as high as 8½ in 100 mm. in specimens from South Carolina referred by him to M. *columbi*.

Convergence of ridge plates toward the summit is said to be distinctive for M. *columbi*, but Osborn states (1922, p. 4) in his re-description of the type of M. *imperator* that "the ridge plates are arcuate and widest apart in the middle portion of the crown." Thick cement is certainly found in many specimens assigned to M. *imperator*, but does not appear to be entirely reliable. Enamel thickness might be useful in separating the species, but quantitative data are not available in the literature. Here, as in the case of ridge plate compression, the angle at which the plates are usually worn frequently gives a highly misleading impression, particularly in illustrations.

In a general way the smaller size and narrower grinders of M. *columbi* seem to be useful in recognizing the species. A notable exception is seen in the case of M. (*Archidiskodon*) *imperator maibeni* Barbour, a giant among mammoths, but which has a lower third molar only 95 mm. wide. This may be compared with the 96 mm. width of the corresponding tooth in a specimen from South Carolina selected by Osborn as a neotype for M. *columbi*, and the 105 mm. maximum width for a tooth of that species from the same locality.

A comparison of all available material of the Naco mammoth with corresponding parts of identified specimens might serve to clarify its relationships. Until such comparison is possible, it seems best to refer it to *Mammuthus* (*Parelephas*) *columbi* on the basis of the relatively small size, ridge plate formula for the

third molars, and compression of the ridge plates. These characteristics serve more clearly to distinguish the specimen from other species such as M. *primigenius*, M. *jeffersonii*, and M. *floridanus*, although it is not far removed from the last-named species in plate compression and total plate count.

Comparisons

A comparison of the Naco mammoth with certain specimens described in the literature is in order. The spout-like rostrum is similar to that found in a mandible excavated from presumed Lower Pleistocene lake beds 60 miles southwest of Cananea, Mexico, about 80 airline miles from the Naco locality. Osborn (1929) named the Sonoran specimen, which is about 20% larger than the Naco mammoth, *Archidiskodon sonorensis*. Judging from Osborn's illustrations, the teeth in the Sonoran specimen are as narrow as those from Naco, but they are obviously longer. The original description does not clarify the characteristics that distinguish M. *sonorensis* from other mammoth species.

Another specimen from Mexico with a prolonged rostrum was tentatively referred by Reyes to *Elephas hayi* Barbour, but was considered by Osborn (1942, pp. 1013-14) to be more nearly related to either M. *sonorensis* or to M. *imperator*. The original paper by Reyes was not available to the present author. Osborn's illustration of the specimen, after Reyes, suggests that it is more nearly comparable in size, at least, to the Naco mammoth than it is to M. *sonorensis*.

Mammoth material excavated at Double Adobe, near Douglas, Arizona, above the bed with artifacts of the Sulphur Spring stage of the Cochise culture was referred by the late Chester Stock to *Archidiskodon* sp. (Sayles and Antevs, 1941). These fossils, consisting of two upper third molars in palate fragments and a piece of tusk, have been re-examined and measured. The posterior plates are gone from both molars, but the estimated plate count is 17 to 20. The teeth show a compression of 5½ to 7 plates in 100 mm. Cement is thin, and the greatest width is 86 mm. for both teeth. Although they are moderately worn, the teeth compare rather closely with those from Naco except for being slightly larger. It should be noted that the angle between the occlusal surface and the ridge plates gives an impression of very wide spacing of the plates. Measured along the occlusal surface the frequency count is 5 plates in 100 mm. for RM^3 and 4½ for LM^3.

Stratigraphic Significance

Well-authenticated cases of association of extinct species of mammals with evidence of Early Man in North America are becoming increasingly common. The desirability of establishing precise paleontological and stratigraphic relationships with the cultural succession is obvious. Further refinement and extension of radiocarbon dating promises to provide an accurate scale of absolute chronology that might throw light on many interesting problems in evolution and extinction of species in late Pleistocene and Recent time. In view of this it seems highly desirable that a start be made in re-evaluating the paleontological data available from known Early Man associations.

Information available at present does not indicate any clear correlative value among the fossil mammoths in late Pleistocene or early Recent. On the contrary, such use as has been made of these animals in establishing a stratigraphic succession in North America throughout the whole Pleistocene is in some doubt. Osborn considered M. *imperator* to be a Lower Pleistocene form, and M. *columbi* to be representative of Upper Pleistocene. The Columbian mammoth is more frequently reported in association with early man than any other species (Sellards, 1940, p. 405), but M. *imperator* is described from several such associations, a recent example being the discovery reported by Aveleyra and Maldonado-Koerdell (1952) from Santa Isabel Iztapan in the Valley of Mexico. Further, Savage (1951) has reported M. *columbi* from the Lower Pleistocene Irvington fauna of the San Francisco Bay area. It should be noted that in terms of plate compression, a presumably progressive feature, the Irvington specimen is closely comparable with that from Naco.

Over a period of several years Fred Navarrete and his son, Marc, have watched the arroyo that yielded the Naco mammoth and have collected numerous fossil bones and teeth, some from the arroyo banks and some as float. Most of the material has come from the upstream side of the mammoth locality. To what extent this material might be contemporary with the Naco mammoth is uncertain. The collection includes material representing mammoth, mastodon, bison, and *Equus*.

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SOME AMERASIAN POTTERY TRAITS IN NORTH ASIAN PREHISTORY *

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ASIATIC ORIGINS HAVE, at one time or another, been suggested or at least considered for a number of traits connected with the manufacture and decoration of the earlier New World pottery. The well-known paper by McKern (1937) is among the most explicit statements on the subject. Griffin (1946; Sears and Griffin 1950a) has held similar views for some time. Like McKern, he has primarily in mind traits of the Woodland pattern of eastern North America, although he also mentions some non-Woodland traits among those which have counterparts in the Old World (1946, p. 45).

Since McKern's paper, the distribution in time of the traits involved has become a lot better established. With the help of the still suspiciously regarded radiocarbon dates, our perspective on ceramic history in the United States has been extended over a span which appears to be that of some four millennia. Among the more significant additions to the Asiatic half of the distributional picture first place must be given to recent Soviet work in eastern Siberia. It is the object of this brief paper to examine some recent distributional information from both continents, but particularly that now available for eastern Asia, and to bring it to bear on the matter of the debt of early New World cultures to Asiatic sources. With this purpose in mind, a chronological table (Fig. 15) has been appended to provide the student unfamiliar with Russian material with at least a skeletal context within which to consider the data discussed.

Most prominent in discussions relating to diffusion within the Amerasiatic Woodland-taiga belt have been textured pottery surface-treatments. Among these, fabric-marking, cord-marking, simple-stamping and check-stamping appear to pose particularly provocative historical problems.

Of the four, fabric-marking is the more widespread in Eurasia. Its earliest incidence seems to be in the Baikal-Gobi area. In the Baikal sequence it dates from the Isakovo stage (*ca.* 4000-3000 B.C.) and occurs in the form of net-impression. Okladnikov (1950a, p. 168) suggests that it may actually reflect the state of textile arts at that level. Whether or not this is the case, spotty distribution in the Old and New Worlds suggests that net-marking is to be considered as an occasional variant of fabric-marking as a whole rather than as an historically distinct technique. For Mongolia, evidence at hand (Teilhard and Pei 1944, p. 31 and Fig. 14; Egami and Mizuno 1935, Pl. X, B: *2-4*; Pl. XV: *1,2*) indicates we are dealing with the impressions of some coarse type of matting. Time placement, on the other hand, is as yet difficult. Teilhard and Pei (p. 50) are inclined to view the Gobi culture as on the whole earlier than the earliest Chinese neolithic, with some overlap. In support of this hypothesis might be adduced the fact that pottery in Mongolia was added to an epipaleolithic base very similar to that of the Baikalian and Trans-Baikalian regions, where the transition seems to be early, and parallelism between the two areas is thus suggested. On the other hand, the lack of reliable time markers and the apparent gap between the Gobi culture and the Suey-Yüan bronze culture leaves open the possibility of a partially or entirely younger dating of fabric-marking in Mongolia where, it must be noted, it does not occur at all Neolithic sites. Yet the evidence from this area, unlike other more definitely (although not, perhaps, more reliably) dated occurrences of the technique in Asia, stands a good chance of being among the earliest of its kind.

In intervening Trans-Baikalia, the Urtuya site (in the Onon basin) yields Isakovo-like pottery (Gorodtsov 1936; Okladnikov 1950a, p. 171), net-marked and considered by Okladnikov coeval with the Serovo stage of the Baikal. The reason for placing this site in the third rather than in the fourth millennium B.C. is not specified.

Much further to the North, fabric-marking of an unspecified variety (presumably not net-marking) is reported for the premetallic hori-

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zon of the lower Lena (Uolba Lake and other sites; Okladnikov 1946, p. 104). This culture extended also to the wooded portion of the Lower Kolyma valley (Okladnikov 1947a, p. 179) with, in Okladnikov's estimation, a certain time lag. Chronology for the Far North is still rather vague, but it is clear that the Kolyma sites in question are not dated any later than 2000 B.C. and that the early pottery culture of the lower Lena is to be placed in the third millennium B.C.

Still in the Siberian taiga and the Lena drainage, fabric-marking occurs at a premetallic site on the Aldan (Kiakshto 1933, cited in Davis 1940, p. 35; Fig. 6). The chronology given by Okladnikov for the Lena valley (1949) suggests that this incidence is probably to be placed in the third or second millennium B.C. It is also more than likely that fabric-marking occurs in the neolithic of the middle Lena proper, although the few sources available to the writer fail to mention it specifically for this region.

To the south of the Gobi desert, the end of the third and the beginning of the second millennia B.C. probably mark the as yet somewhat mysterious appearance of the Chinese neolithic. The rather thorough examination given surface-treatments of prehistoric Chinese utility wares by Wu (1938) would indicate that fabric-marking is not as widespread at this level as Andersson's (1923a; 1943) descriptions suggest. Nevertheless, it seems definitely authenticated for Ch'eng-tzu-yai in Shantung (Black Pottery group; Li Chi and others, 1934, Pl. X: 32-33), Sha-kuo-t'un in Manchuria (Andersson 1923b, p. 21; Wu 1938, p. 110), Hsia-t'un II in northern Honan (probably Shang in time; Wu 1938, p. 39), and for Ch'i-chia-p'ing (Bylin-Althin 1946, Pl. X:3; XI:3), Pan-shan and Ma-ch'ang (Wu 1938, pp. 97, 101) in Kansu. These Kansu sites are dated as Shang or barely prehistoric by Wu, but are placed considerably earlier by Andersson (1943, p. 295). At none of these sites does fabric-marking appear to be the major surface-treatment.

In Japan, the technique makes its appearance in the Horinouchi stage of the later Jomon phase (Groot 1951, p. 59), for which a radiocarbon date of 2563 B.C. ± 300 has been given (Johnson 1951, p. 18, sample 603). Whether its presence reflects diffusion from China or not is at present hard to determine. Dating in China is as yet too shaky, Korean data are mostly unavailable, at least in English, and scanty information for the Amur region (Field and Prostov 1937, p. 481, after an Okladnikov report unavailable to us) indicates the presence there of fabric-marking in a complex (Stage II) showing close relationship to Jomon as a whole (Okladnikov 1936, p. 276). More information and better dating could show whether diffusion took place via Korea or via Sakhalin (where fabric-marking may also occur — Schrenk 1881, p. 450, from China or from the lower Amur.

The earliest pottery in Eterofu, one of the southern Kuriles (Schnell 1932, Pl. II) is fabric-marked and quite probably of Japanese derivation. According to Schnell, the ware shows similarity to the Omori pottery of Japan (Usude). On the Eterofu material, as in Horinouchi and in several instances in China (Wu 1938, pp. 97, 101), the treatment is confined to the basal portion of the vessel. This trait also occurs in Alaska (Oswalt 1952, p. 20, Fig. 11; De Laguna 1947, p. 228), where it may possibly be a case of secondary convergence.

The spread of fabric-marking in western Eurasia cannot as yet be tied in with the Far East. Geographically, there is a gap between the Baikal occurrence and that on Andronovo vessels in northern Kazakhstan (Bryusov 1951a, p. 302). The gap is also temporal since, in the latter portion of the second millennium B.C., fabric-marking is probably out of use in Baikalia but already current in the Middle Russian forest zone. In this latter area, it may occur towards the beginning of the second millennium, and is certainly in use *ca.* 1500 B.C. (Bryusov 1951a, Fig. 2:1). It is also found to the north, on the earliest pottery of the Kargopol' culture and elsewhere (Foss 1947, pp. 35, 38, 44; Bryusov 1951b, p. 26 and Fig. 6). It persists as late as 500 B.C. in the far north, and as late as the first centuries of our era in the Volga-Oka region (Dyakovo culture; Tretyakov 1947, Bader 1950, 1951). Although no connection between the European and Asiatic foci of fabric-marking is apparent at present, it must be noted that the pre-Andronovo horizon of the southern Siberian steppe is hardly known.

Cord-marking is somewhat less frequent than fabric-marking in Eurasia. Quimby (1947, p. 176), in his analysis of Kamchatka pottery, claims that the two treatments cannot be distinguished, except in certain cases. This must be considered an overstatement, since most archaeologists working in the eastern United States seem to make the distinction quite con-

fidently. Be that as it may, cord-marking appears to occur in eastern Asia in a number of indisputable instances, although it is to be suspected that some of its incidences have not been identified as such.

The sherds mentioned by McKern (1937, p. 142) from Mongolia might be considered among the older examples of this technique. However, the dating of Mongolian occurrences (also illustrated in Egami and Mizuno 1935, Part 1, Pl. X A:10; Pl. XV:24) is subject to the same reservations as that of the Gobi culture as a whole, as noted in our discussion of fabric-marking.

The Chinese data are perhaps more reliable, but discussion of them necessitates a statement of what is subsumed under "cord-marking," a category which has the advantage and disadvantage of including varieties of surface texture which are probably related historically, not easily distinguishable, yet distinct. In the New World, the tradition has been to identify cord-marking with cord-wrapped paddle malleation (cord-roughening). This interpretation is supported by ethnological evidence. Thus, Holmes (1903, Fig. 38) illustrates a Cherokee cord-wrapped paddle. Wu (1938, pp. 37-38) cites similar ethnological evidence from northern China, where cord-wrapped paddles are used in paddle-and-anvil pottery manufacture. He also adds the information that the anvil may also occasionally be wrapped with fabric (this, of course, is of interest in view of the occurrence, in North America as well as in Asia, of interior fabric- and cord-marking). Wu also points out, however, that the only incontrovertible evidence of cord-paddling is the criss-cross and patchy nature of the resulting impressions. It follows that there are instances of cord-marking, both in North America and in Wu's Chinese material, which are susceptible of being interpreted differently. Since cord-marking of a non-patchy and regular type is particularly prevalent in Chinese material, it is little wonder that the Old World tradition has always leaned toward the use of such terms as "mat-impression" (Andersson) or "basketry-impression" (Jochelson 1928, p. 77, for Kamchatka, hence Quimby's quandary) and that even a writer like Bylin-Althin (1946), aware of cord-paddling, "is not convinced that all somewhat irregular cord-impressions can be interpreted as the work of a beater" (p. 456).

Wu describes and offers his interpretation of several types of cord-marking found on Chinese material, besides cord-paddling and true fabric-marking. One of them consists of regular, parallel series of imprints, vertical or diagonal in relation to the lip of the vessel, and frequently crossing one another toward the base. This he interprets as the impression of a strengthening cord-mould. Bylin-Althin (1946, p. 413) similarly considers it due to the application, on to the wet clay, of a "sewn basketry" mould. Both Holmes (1903, p. 71) and Wu (p. 73) quite independently arrive at the conclusion that the "mould" suggested by textile imprints on pottery should not be considered a true mould but rather as some type of framework applied to the walls of the as yet unfired vessel for support. A variant of this type of marking, in which the impressions are horizontal, Wu (p. 62) interprets as due to the wrapping of a single cord around the freshly moulded vessel as it is built up. Another treatment reported by Wu consists of horizontal bands of vertically oriented cord-imprints which do not, however, align in an uninterrupted pattern from base to lip but form distinct and somewhat overlapping bands or zones. He explains them as marks of a "belt-mould" used in manufacture (p. 32). Finally, another surface texture, rather similar to cord-paddling in appearance, he interprets as the work of a cord-wrapped roller (p. 34).

Whether Wu's explanations of these treatments are correct or not need be of no direct concern here. For that matter, the quality of much of our information scarcely warrants systematic distributional investigations of all of Wu's varieties of cord-marking. The relevance of Wu's analysis to our present problem is that it calls attention to the fact that the terminological gap between the Old World and the New probably does not, in this case, represent a gap in the distribution of archaeological material. A corollary to this is that archaeological interpretation, however founded, may become traditional. Thus, references in the literature to "mat" and "basketry" impression can be shown to cover instances of cord-paddling in Asia; references to "Cord-roughening," cord-wrapped paddle marking and cord-marking in the New World may cover treatments which an Orientalist, aware of paddling, would nevertheless not interpret as such.

In China, actual paddling (according to Wu's definition) is widespread but also, it would seem, relatively late. Wu's data indicate its presence in northern Honan, Shansi, Kansu, Manchuria and Sinkiang (Turfan). In all cases except the latter, the technique seems to appear on the Shang horizon or slightly earlier. The Turfan occurrence is undated (Wu 1938, p. 139). Ch'i-chia-p'ing (Bylin-Althin 1946, Pl. XII-XIV) and Lohant'ang West (*ibid.*, Pl. XXXVI; XXXIX:2; XXXVIII:11; XLI) may represent the earliest incidences. There seems to be some argument regarding the dating of these sites, although it seems rather probable that Ch'i-chia at least is prehistoric.

"Cord-mould" marking is also widespread and attested relatively early. It is of the vertical or diagonal type at Ch'in-wang-chai and Pu-chao-chai in western Honan (Wu, pp. 51, 55; Andersson 1923a, Fig. 1:1; Pl. XV:5; XVI: 7) (these sites are considered by both authors as close in time to Yang-shao ts'un) and at sites in Shansi and Shensi, most of them on the Shang time-level, according to Wu. To these occurrences must be added those at Ch'i-chia-p'ing and Lohant'ang West (Bylin-Althin 1946, Pl. VI; XXXIII; XXXV) ("Yang-shao" in age, according to Andersson or, in Wu's terms, barely pre-Shang). The horizontal variety of cord-mould impression occurs in the lower level at Ch'eng-tzu-yai (Wu, p. 62) and at other Shantung sites of the Black Pottery period (*ibid.* p. 70).

The "belt" type of marking, consisting of tiers of parallel vertical cord-imprints, occurs on what Wu deems to be the earliest cord-marked pottery in China, at Yang-shao-ts'un (p. 48) and Hou-chia-chuang II (pp. 32-33). Hamada and Mizuno illustrate (Fig. 38) what may be an instance of this technique at Hung-shan-hou, a peripheral painted pottery site in Jehol, and a similar specimen is figured by Bylin-Althin for Lohant'ang (Pl. XXXII).

Finally, the roller type is reported from two sites in northern Honan, both placed by Wu in the Shang period (Hsiae-t'un II, p. 38; Hou-chia-Chuang III, p. 34).

Roller-marking is of interest since it is reported for the earliest prehistoric ware as yet found in Japan, the Inaridai of the Kwanto valley (Groot 1951, p. 21, Pl. I, II). Whether the interpretation given by Japanese archaeologists to this surface treatment was inspired by Wu's analysis is a question the writer is unable to answer. If cord-marking at this early level in Japan is actually of the roller variety, a perplexing problem arises, since Wu (p. 34) interprets this technique as a decorative survival of an originally functional treatment. It is conceivable therefore that at the source of Inaridai lies a continental focus of (functional?) cord-marking of an antiquity comparable to that of fabric-marking. At least such might be the implication of the very early radiocarbon dating of Japanese manifestations which are probably considerably later than early proto-Jomon.

Such a hypothetical focus is also suggested by the occurrence of what Okladnikov (1947b, p. 43) specifically identifies as cord-wrapped paddle marking at a neolithic site on the lower Khatanga and also, it would seem (*ibid.*, p. 44), at Kullata, a middle Lena premetallic site culturally related to the Khatanga complex. These incidences are to be placed in the third or the second millennium B.C.

Cord-marking of the regular vertical type occurs on the Aldan River, in a neolithic context (Kiakshto, cited in Davis 1940, p. 35 and Fig. 6), and along the northern shore of the Sea of Okhotsk and in northern Kamchatka, in the Nayakhan and Kulki complexes (Jochelson 1928; Quimby 1947) at an unspecified but presumably A.D. date. Rudenko (1948, p. 175) notes that this presumably Koryak pottery occurs as far East as the shore of Behring Straits, and Okladnikov (1936, p. 277), on his side, mentions the late appearance in the lower Amur region of a Koryak-like complex including cord-marked pottery. The recent continuous distribution of cord-marking can hence probably be inferred for the Okhotsk coast and its source placed, perhaps, in the Lena basin. In this connection, impressions not unlike those ascribed to a "cord-mould" by Wu appear on some early Jomon vessels (Groot, Pl. XVI) and on early ware from Eterofu (Schnell 1932, Pl. VIII) and suggest a distribution of this form of cord-marking distinct from and possibly anterior to that on the continental shore of the Okhotsk Sea.

Another probable occurrence of cord-marking in Asia is that cited by Chernetzov (1947, p. 80) for a site on the Irtysh, dated toward the end of the Andronovo horizon (beginning of the last millennium B.C.), where pottery has "a roughened surface reminiscent of fabric-marking." This site is apparently the earliest

yet found in the Omsk area which, Chernetzov thinks, was populated rather late (*op. cit.*, p. 91).

In European Russia, the situation is again confused linguistically without, however, there being an analysis as forthright as Wu's to deal with it. The occurrence of fabric-marking in the middle and northern Russian zones has already been noted. Bryusov's article on this technique (1951a) also mentions the occurrence of "imprints of cord wrapped over a solid base," and his illustration of a sherd from Yazykovo (a late site of the Lyalovo culture) bears out his statement (Fig. 6:2). Yet, he apparently also subsumes decorative single-cord impression on the rim in the same category, as is indicated by his discussion of a Kargopol' occurrence and accompanying illustrations (Fig. 9:2; 10:4). It is therefore not clear whether his mention of the technique for the Ryazan' culture (a Forest Neolithic culture of the second millennium B.C. in the Oka basin) alludes to actual cord-marking. Moreover, his discussion of irregular fabric-marking caused by hand-woven fabrics and current in the second millennium throughout the Forest Neolithic is accompanied by illustrations of sherds from late Volosovo, Ryazan' and northern sites (Figs. 2:2, 3; 5:2-4; 6:2; 7:4; 8; 9:1; 10:1) showing imprints of strands the woven arrangement of which is not apparent, but which he apparently considers as elements of a type of fabric. It would thus seem safest to conclude, in the absence of actual laboratory material, that fabric- and cord-marking both were current in the latter portion of the second millennium in the middle and northern Russian "submesolithic" cultures, and present there possibly as early as the beginning of that millennium (Vladychenskaya site; Fig. 5:2, 3; looks more like cord- than fabric-marking), without attempting to delimit more accurately their respective distributions.

Terminology and interpretation also pose thorny problems in connection with the treatment (or treatments) known in the eastern United States as "simple-stamping," in the Eskimo area both as "paddling" and "striation" and in Asia as "striation" (in Russian sources) and "basketry-impression" (in references to Chinese material).

The regularity of the vertical ridged impressions found on some Chinese neolithic utility wares (Yang-shao-ts'un — Andersson 1923a, p. 28; Pu-chao-chai — Andersson 1923a, XV:1, 7; XVI:1; Wu, 1938, Figs. 32, 33; Wu-lan-ku — Andersson 1943, Pl. IC; Ch'i-chia-p'ing — Bylin-Althin 1946, Pl. I-V; VI:4; Lohant'ang West — *ibid.*, Pl. XXV, XXVI, XIIIL:5; Ch'i-li-tun — *ibid.*, Pl. LV:14; Hsiao-shih-hsia — *op. cit.*; Ch'eng-tzu-yai — Li Chi and others, Pl. X: 3-5; Hou-kang II — Wu 1938, Fig. 2, b, c) belonging to both the painted and black pottery complexes is, one is led to suspect, largely responsible for their interpretation as imprints of a solid foundation of broad, smooth vegetal fibers over which the vessels were moulded (for the most explicit statement of this, cf. Bylin-Althin 1946, p. 411). Similar imprints occur on wares of the historical time level (Egami and Mizuno 1935, Pl. IV:9; Han or later in age).

Yet, these imprints are hardly distinguishable from what an Americanist would call regularly-applied vertical simple-stamping as occurs, for instance, on some late Mandan pottery (cf. Strong 1940, Pl. 5:I). It is curious to note, at this point, that ethnological accounts do exist for the middle and lower Missouri areas (Grinnell 1889, p. 256; Hunter 1823, p. 289) in which the use of a basketry mould is described in connection with the manufacture of pottery. Such a framework, if its existence is to be admitted at all, would of course be different from that indicated by such indisputable basketry impressions as occur in Asia and in America, in Manchuria (Hamada and Mizuno 1938, Pl. XXVII, XXXVII, XL, Fig. 38) as well as in the Ozarks and the Southwest.

It is also quite clear that irregular and criss-cross ridging as occurs in many other areas is best interpreted as paddle-marking. Paddles used by the Eskimo (Oswalt 1952, p. 25) testify to the reality of this technique. Such is the interpretation given ridged surfaces (rather regular in appearance) on Yayoi pottery in Japan (Suenaga and others, 1943, Pl. LIII:6) and most ridged, regular and irregular, imprints on pots of the eastern United States. That the method is absent from China can certainly not be asserted at this point and it is not unlikely that "striation," under whatever form it occurs, is of continental origin in the insular regions of the Far East, particularly in Yayoi where influences from the Chinese culture sphere are marked.

The term "striation," as used in reference to Siberian and Eskimo material, denotes surface textures which, at least in the Eskimo case, can

be demonstrated to include both paddled and striated (*sensu stricto*) treatments. As used by the Russians to apply to evidence from the lower Lena-Kolyma neolithic (Okladnikov 1947a, p. 178) and to neolithic material from Yakutsk (Okladnikov 1947c, p. 98), it is ambiguous. "Striation" is perhaps also the noncommittal term to apply to the "rippled" treatment on sherds from the Aldan neolithic (Kiakshto in Davis 1940, p. 35 and Fig. 6). Sherds illustrated for Baikalia (Ryumin 1951, Fig. 4:10 — Serovo stage; Petri 1916, Pl. XIII:20 — Ulan Khada site, i.e., Serovo to Glaskovo in date) should also perhaps be described as striated, with the qualification that the Ulan Khada specimen seems regularly-marked enough to be acceptable as an example of paddling.

Non-paddled, definitely striated surfaces can be cited for a marginal painted-pottery-Gobi culture site in Jehol (Hamada and Mizuno, Fig. 38) and for the Eskimo site described by Okladnikov (1947a) near the mouth of the Kolyma. In technique, such texturing is little different from that which is termed "simple-stamping" on fiber-tempered pottery in the Southeast (Wheeler Simple-Stamped — Sears and Griffin 1950, p. 6, "haphazardly applied, frequently criss-crossing impressions of a single-edged implement"). In the case of some Eskimo pottery (Oswalt 1952, p. 20; Fig. 8:1-4) of Japanese ware of the proto-Jomon period (Groot, pp. 25, 32; Pl. XI, b, h, XII B, Pl. XIII) and of a relatively recent New England type (Windsor Brushed — Smith 1950, p. 93) the markings are judged to have been made with the edge of a shell.

On the whole, the typological problems raised by striation (*sensu lato*, i.e. fiber-mould marking, grooved-paddle marking, tool-streaking and shell-streaking) are remarkably similar to those involved in cord-marking. As in the case of the latter technique, we are faced with a type of texturing which appears to exhibit a certain historical-distributional unity and which may probably be, in some instances, considered functional and, in others, traditional and nonfunctional. As in the case of cord-marking (and, for that matter, fabric-marking), a mould-paddle dichotomy is adumbrated by the scanty evidence, a dichotomy possibly independent of and cross-cutting the function-tradition distinction. The parallelism of the mould-paddle distinction suggested by interpretations which have been given to both cord-marking and striation becomes particularly evident if one accepts the explanation of some ridged surfaces (as in China) as fiber-mould marks, and of others as impressions of "a paddle wrapped with straw or rushes" (Holmes 1903, p. 198). Only a study of actual first-hand material from both continents could allow us to reach some more precise historical conclusions and interpretations regarding ridged or striated surface treatments.

The distribution of striation from east to west in Eurasia is, like that of fabric- and cord-marking, a broken one. The Yamnaya and Catacomb cultures of the southern Russian steppe have it, and it is characterized as careful and neat, as opposed to the more careless type found in the later Srubnaya culture of the same area and in "submesolithic" sites of the Russian Arctic and Subarctic Northwest (Kargopol' II to IV, White Sea III) (Foss 1947, p. 38). The White Sea striation is interpreted by Russian archaeologists as the work of a toothed implement (see also Voyevodsky 1936, Pl. III:2 for similar evidence from the lower Oka). Striation persists in the Dyakovo culture of the middle Russian zone into the first millennium B.C. (Tretyakov 1947, Fig. 7).

Distributionally, check-stamping appears to be less complex a phenomenon than cord-marking or striation. It occurs at sites of the Black Pottery horizon in Honan (Hsin ts'un — Wu 1938, p. 44; Pu-chao-chai — *ibid.*, Fig. 61 and Andersson 1923, Pl. XVI:8), possibly in the Chou level at Ch'eng-tzu-yai (Li Chi and others, Pl. IX:24) and at Ch'i-chia-p'ing (Bylin-Althin 1946, Pl. IV:17). In Trans-Baikalia, it is noted for a complex dated as coeval with the Glaskovo stage of the Baikal (Okladnikov 1950b, p. 89). On the lower Amur, it is characteristic of the lowest level of the four-level stratified site of Bol'shoy Dural (Okladnikov 1951, p. 301), dated at the end of the second millennium B.C.

In the extreme North, check-stamping is present at what may be an earlier time-level in the lower Lena Kolyma neolithic (Okladnikov 1947a, p. 178). Collins cites a Japanese source for its occurrence in Japan (1937, p. 349) and also notes its prevalence in Southeast Asia.

Yakut pottery, in historic times, was decorated with what might be called localized check-stamping, in which multiple-check panels were spaced and kept distinct (Jochelson 1934, p. 161, Figs. 51, 53). A similar mode of decora-

tion is described by Dmitriev (1951, p. 68) as occasional on Shigir pottery. A technique similar to check-stamping is mentioned by Formozov (1951, p. 13) for pre-Andronovo sites in eastern Kazakhstan. In this connection Formozov refers to a report unavailable to the writer in which Okladnikov makes this type of stamping a diagnostic trait of the eastern Uralian-western Siberian archaeological province on the eneolithic level.

The general outlines of the distribution of textured surfaces in Eurasia, despite inadequacies in the record, thus emerge on the whole rather clearly. Geographically, the complex as a unit appears to center definitely in eastern Asia, while temporally it seems mainly premetallic. A secondary focus in eastern Europe appears to be somewhat later, whereas west of the territory of the USSR occurrences are, to the writer's knowledge, only sporadic. Fabric-marking is the earliest type to be authenticated and its origins may be tentatively placed in the Baikal region. (The occurrence of mat-marking at Tab al-Hammam and Byblos in Syria, at an upper Hassunan time level [i.e. probably in the fifth millennium B.C.], pointed out recently by Lauriston Ward at the Symposium on Old World Archeology at the 51st Annual Meeting of the American Anthropological Association in Philadelphia, suggests the possibility of an even older focus of fabric-marking in the Near East and might even point toward an independent later history of this technique in western Eurasia.) Cord-marking may be as early, the evidence from Japan being chronologically hard to place, although radiocarbon dates suggest that proto-Jomon may have an antiquity comparable to that of the earliest Baikal pottery. Presumably the Japanese occurrence reflects diffusion from an unknown mainland source, judging by the later continental distribution of the technique. Striation may have an analogous history, unless proto-Jomon shell-streaking is to be considered as a case of secondary parallelism with mainland occurrences, derived from a generalized "texturing" tradition of continental origin. In this case, the mainstream of the non-textile ridging tradition of surface finish can be considered as appearing in Japan only in the Yayoi period (i.e. *ca.* 500 B.C.) and the earliest known occurrence of striation would have to be placed in the Lena basin (Uolba Lake, Yakutsk, Serovo). This, of course, is assuming that the relatively late dating of the Chinese neolithic now in vogue is correct. Finally, check-stamping seems the least widespread of the four techniques. Its distribution appears broken and includes an early (third millennium B.C.) incidence in the Far North, and later occurrences in the Chinese sphere (second millennium). In southeast Asia, check-stamping is presumably later than in China. An as yet undocumented possible focus of check-stamping in western Siberia is of undetermined age.

Perhaps the most significant feature of these distributions is the concentration of the entire texturing complex in premetallic eastern Siberia, in the third and second millennia B.C., in areas which represent the easternmost points which are archaeologically-known in the Woodland zone of Asia. Within the limitations of the available record (which is more or less blank east of the Kolyma River), therefore, texturing can be seen as present, as it were, on the threshold of the New World *ca.* 2000 B.C.

Dentate stamping is another one of several Amerasian ceramic techniques for which diffusion from a single source seems likely, despite some puzzling evidence. It is so widespread throughout Eurasia that detailed references regarding it would be tedious. Suffice it to say that it is near-universal and that its appearance in many cases is contingent on that of pottery itself on the territory of the USSR. Thus, it appears in the Kel'teminar culture of Khorezm and neighboring Turkmenia, the earliest ceramic complex, with the exception of Anau, in eastern Soviet Asia. It is also found on the earliest pottery of the Minusinsk Basin, eastern and northern Kazakhstan, the Urals and the Ob' basin, the middle and northern Russian forest zones and in the Amur region. In the form of shell-stamping it is present in northern proto-Jomon I, proto-Jomon II and early Jomon in Japan (Groot 1951, pp. 25, 32, 38; Pl. IX). It is widespread in the Korean neolithic (Hewes 1947, Map). Its absence therefore in two areas where other Amerasiatic traits occur is particularly conspicuous.

It is remarkably lacking in the Chinese sphere, to which it is peripheral, occurring as it does in western Mongolia (Bergman 1939, p. 36), Trans-Baikalia (Rygdylon 1949), western Kansu (Ch'i-chia-p'ing — Wu 1938, p. 104, Fig. 47b; Andersson 1943, p. 80, Pl. XXXVI; Bylin-Althin 1946, p. 402, Pl. XII, XIII), Manchuria (Hamada and Mizuno 1938, Pl. 37, Fig.

37) and Korea. Its late appearance in the Lena basin is also noteworthy, since it is not attested in the Baikal region before the Serovo stage (Okladnikov 1950a, p. 210), in the middle Lena area before the appearance of bronze (Okladnikov 1947c, p. 98) *ca.* 1000 B.C. and remains unreported from the lower Lena. Yet Kiakshto apparently reports it for the Aldan neolithic (Davis 1940, p. 35).

The hypothesis of convergence on both continents for this technique seems weak on typological grounds in the light of the occurrence in Asia not only of dentate stamping, but of both plain and dentate rocker-stamping. These modes of decoration have distributions which are coincident with that of dentate stamping, although they are more restricted. Dentate rocker-stamping is reported for Kel'teminar (Formozov 1951, p. 7), for an Omsk site of the Karasuk period (Chernetzov 1947), early Shigir (Rauschenbach 1951, p. 58, Fig. 18:7) and Manchuria (Hamada and Mizuno, *loc. cit.*). Plain rocker-stamping is known from Manchuria (*ibid.*), for the late Omsk site mentioned above and, possibly, for the earliest pottery of Japan ("nail-shaped impressions," Groot pp. 23, 25, 43 and Pl. XXI). Finally, the use of dentate stamping as a background over which boldly-incised curvilinear patterns are applied is specifically mentioned by Okladnikov (1936, p. 276) for the earliest stage of the Amur neolithic. "Zoning" is also known from Japan, in the Moroiso, later Jomon and final Jomon periods, i.e. probably in the first three millennia B.C., on a background of cord-wrapped-stick impressions (Groot 1951, pp. 43, 58, 60-62, 64, 68; Pl. XLIc, XLVIb, XLVIIIa, LIa, LIII, LVIA).

In the light of this information, one is led to strongly suspect a gap in the available information regarding the distribution of the threefold dentate-rocker complex. The Japanese evidence is, as in a number of other instances, suggestive of reflections from an as yet unknown or poorly known mainland source, in this case possibly the Amur-Manchuria-Korea zone. The Aldan occurrence must also be kept in mind as geographically and perhaps chronologically significant. In view of the facts, two hypotheses concerning the introduction of the dentate-rocker complex into America present themselves. Either it took a different route than that taken by surface texturing, possibly a southern coastal one, or our information on the lower Lena-Kolyma neolithic is incomplete. The record for Siberia, although more rewarding than it was fifteen years ago, is certainly not of a quality to justify negating one of these hypotheses in favor of the other. It does however yield typological and distributional evidence which points toward diffusion.

Two other decorative techniques, bicontinental in distribution, remain to be mentioned here. These are cord-impression and cord-wrapped-stick impression.

Cord-impression is well-known in European Russia during the second millennium B.C., being found in late Tripolye (Usatovo-Horod), some middle Russian neolithic sites (Bryusov 1947, p. 18) as well as in the North (Kargopol'-Bryusov 1951a, Figs. 9:2, 10:4; late White Sea-Foss 1947, p. 38). It becomes widespread in the early neolithic cultures of northern Europe and in the so-called Battle-Axe cultures of northern and central Europe (Childe 1950, pp. 116, 138) of *ca.* 1500 B.C., although absent from the Yamnaya culture (*op. cit.*, p. 138). It appears possible, although not proven, that cord-impression diffused into Europe from the southern and/or central Russian zones, where its presence in the Oka basin may be the earliest on record west of the Urals. Cord-impression becomes later especially characteristic of the bronze-age Ananino culture of Middle Russia (Bader 1951, pp. 21-22) and also occurs in Dyakovo (Tretyakov 1947, Fig. 8).

The recorded Asiatic occurrences of the technique appear definitely earlier than the European ones. Yet they are scattered and frequently not characteristic of their contexts. Thus, cord-impression occurs but is rare in the Shigir culture (Dmitriev 1951, p. 67), the long time span of which inhibits definite dating, except for those sites which have been sequentially placed by Rauschenbach (1951). It is cited for late Kel'teminar (Formozov 1951, p. 10) where it is used in a "ladder-design" similar to that found in late Tripolye. Eastward, we find scattered incidences which are probably no earlier in time than Kel'teminar and in some cases demonstrably later. These include Ulan Khada (Serovo to Glaskovo — Petri, Pl. XIII: 26) in Baikalia, Sha-kuo-t'un (Andersson 1923b, p. 23; Wu 1938, p. 112) in Manchuria and the Kulki complex of western Kamchatka (Quimby 1947, p. 175, Pl. 13, A-F). It can be seen, thus, that the case for diffusion into the New World is, on the Asiatic side, far from

proven. Although the technique appears early in eastern Asia, it is not highly prevalent at any time, nor is it documented for key areas at the proper period. Possibly considerations of the order brought forth in connection with dentate stamping should again be here invoked.

The case for cord-wrapped-stick impression, widespread in the Woodland pattern in North America, is at present definitely lame. The only area in Asia where this mode of decoration seems to have been prevalent is Japan, at least if we are correct in interpreting, on the basis of Groot's illustrations (Pl. XIV-XIX; XXV; XXXIII; XXXIV, etc.), as cord-wrapped-stick impression a technique which references in the English language unanimously call "cord-impression." It appears in late proto-Jomon and continues throughout the phase to which it gives its name. Naturally enough, it is also present on the Kurilian island of Eterofu (Schnell 1932, Pl. 9E) in a derivative context. Confusingly, it is also reported as present but rare on Shigir pottery (Dmitriev 1951, p. 67) where it is interpreted as cord-wrapped cord impression. To postulate the introduction of cord-wrapped-stick impression into the New World from the Old, one thus has to rely on a hypothetical mainland distribution for which, this time, there is not a shred of evidence. The question on the Asiatic side therefore remains open.

To conclude our review of the Asiatic data, we might mention one of three possible vessel-base forms which occur on both continents, namely, the conoidal base, a widespread Woodland trait. Its distribution in Asia seems rather significant, since it is characteristic of the early Isakovo fabric-marked pottery of the Baikal (Okladnikov 1950a, p. 168 and Fig. 63), of the earliest pottery of Japan (Groot 1951, Pl. I) with its cord-marking, striation and dentate stamping, of the Khatanga neolithic cord-paddled ware (Okladnikov 1947b, p. 43) of Lena neolithic pottery (Okladnikov 1949, Fig. 29), and of cord-marked and cord-impressed pottery in western Kamchatka (Quimby 1947, p. 175), although there seems to be some doubt regarding vessel form in this latter case. These forms which, it might be added, are direct-rimmed and, like most pottery in northeastern Asia, granular-tempered (an important exception is the fiber-tempered ware of early Jomon), thus appear to cluster with other traits in a manner suggesting a complex of some antiquity in eastern Asia. The form of the lower Lena-Khatanga vessels is unfortunately not recorded by Okladnikov, but the evidence still is rather suggestive of the diffusion of a complex including pointed bottoms from northeastern Asia into North America. Of course, the presence of flat-bottomed pottery in the earliest Amur cultures, in Sakhalin or in Jomon, and the occurrence of round-bottomed forms in China, and the later Baikal and Lena cultures could equally well be cited as items of comparison with North America. Yet these two other forms (and particularly the globular) are of lesser value in this case since they tend to be more frequent and less distinctive the world over, while at the same time their incidences fail to cluster as clearly with those of other Amerasian traits. Conoidal bases, on the other hand, are none too frequent in the rest of Eurasia, occurring as they do in early Minusinsk pottery and in some late submesolithic manifestations in northern Russia.

Some early and problematical occurrences in western Asia of techniques discussed here might be mentioned at this point. They include the "rippling" on Badarian pots (Childe 1952, p. 43 and Pl. III, b) and rocker-stamping and cord-impression in the North Syrian neolithic (*ibid.*, p. 218) and in the Harappa culture of the Indus valley (*ibid.*, p. 180), respectively.

Since our emphasis here is primarily on Eurasia, American distributions will be examined only briefly and only in reference to the earliest occurrences of the traits under discussion.

The salient feature of these distributions in America is that the appearance in time of most of the features we have traced through Asia is linked with that of pottery itself in the areas of their first appearance.

Thus, fabric-marking occurs on what Sears and Griffin (1950b) state to be the earliest pottery in the area of its appearance, e.g., Baumer Fabric-Marked in southern Illinois and adjacent areas, Fayette Thick in portions of the Middle West and in Kentucky, and other types in New York (Smith 1950, p. 137), New Jersey and Maryland(Manson 1948, p. 225), to mention only a few. The same holds true of cord-marking, which is widespread and early in New York (Ritchie 1944, p. 238, for the Brewerton focus; Smith 1950, p. 137 for North Beach), Maryland (Manson 1948, p. 226), Illinois and elsewhere. Simple-stamping, although more localized, occurs on some of the earliest pottery

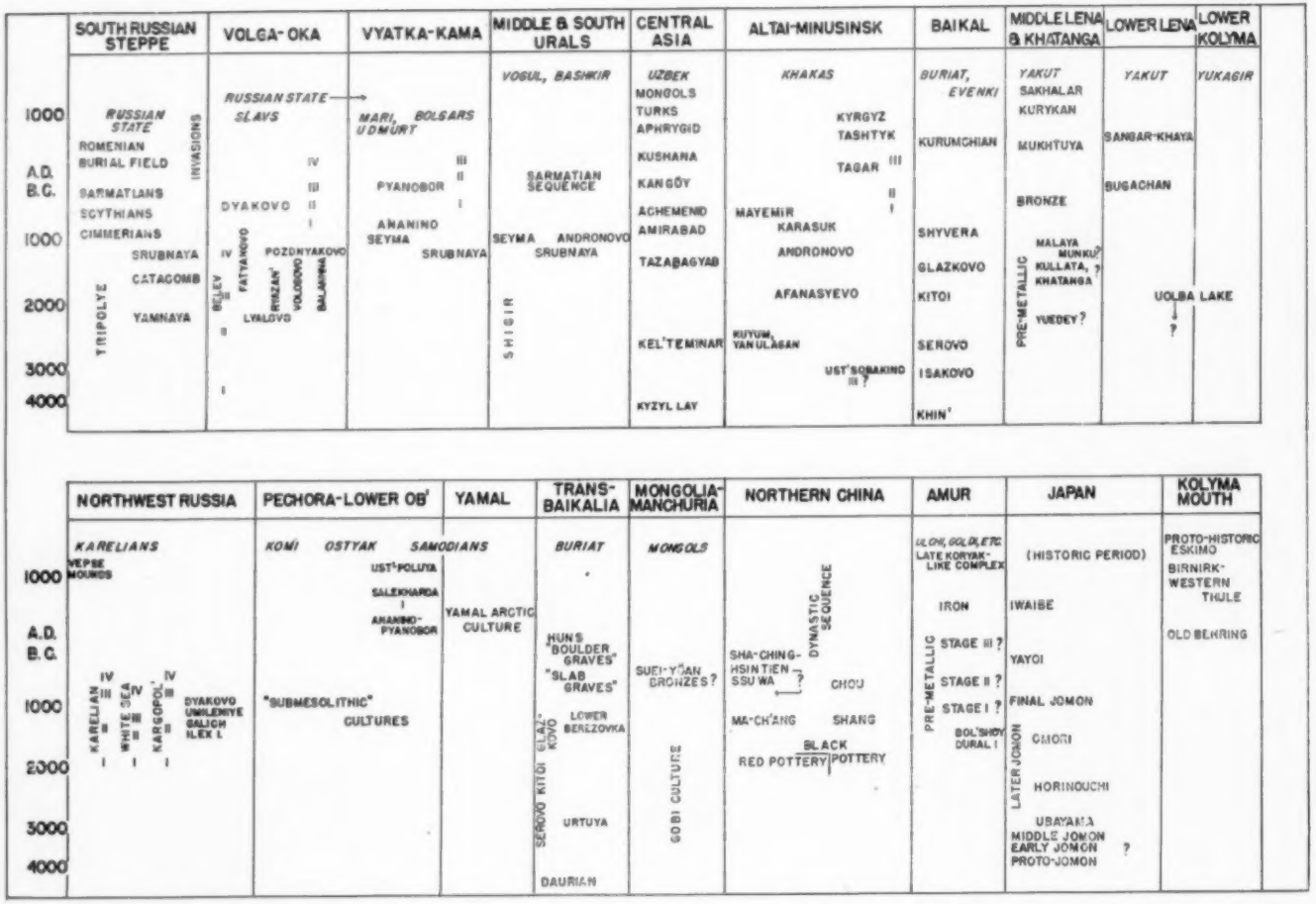

FIG. 15. This chart is based mainly on a consensus of Soviet sources. Those which contain information directly relevant to the theme of the present paper are cited in the bibliography. Question marks indicate either a lack of definite statements regarding the temporal position of some cultures or disagreement on the part of the sources. The Japanese sequence, taken from Groot, has been depressed entirely on the basis of two radiocarbon dates given by Johnson (Samples 548 and 603). The alignments suggested here cannot be considered definitive and the presentation for northern Asia as a whole is by no means complete.

of the Middle West (Phillips and others, 1952, p. 71) and the South (Wheeler, Mossy Oak — Sears and Griffin 1950a). Check-stamping is less well documented, its first prominent appearance being in the still early Deptford complex. That the technique is not entirely absent from the immediately post-Archaic horizon however is suggested when Phillips, Ford and Griffin (1952, p. 88) state that it is "sparse in early and middle Woodland" in the Ohio valley.

Griffin and Krieger (1947) have assembled data indicating the occurrence of fabric-marking (and possibly cord-marking) in Mesoamerica. Although the actual material is meager and its dating is debatable, these occurrences are significant since they constitute evidence of these surface treatments in the area extending from the eastern United States to northern Argentina, where fabric-marking and cord-marking (Willey 1946, p. 42 and Pl. 22: e, g) are found again. Fabric-marking is also reported from Venezuela (Kidder 1948, pp. 419-26, 430).

Dentate stamping also appears with pottery in some areas of the eastern United States, in the Brewerton and North Beach foci of New York (Ritchie 1944, p. 241; Smith 1950, p. 137) and on fiber-tempered ware of the Wheeler and Pickwick Basins (Sears and Griffin 1950a). Dentate rocker-stamping is also attested for the Brewerton focus (Ritchie 1944, *ibid.*, and Pl. 114:9). Plain rocker-stamping does not seem to be recorded for as early a level in the United States, unless the shell-heaps of Maine and Massachussets where it occurs (Phillips and others 1952, p. 90) date to the beginnings of pottery in New England. Otherwise, the technique doesn't seem to be current before the Hopewell horizon. Yet, in Nuclear America, it occurs in Formative cultures, in such complexes as Tlatilco (Phillips and others 1952, p. 89), carbon-dated at the middle of the second millennium B.C. (Johnson 1951, p. 7, Sample 199), Ulua Bichrome and Cupisnique (dated at *ca.* 900 to 700 B.C. on the basis of radiocarbon samples, *vid.* Bird 1951, p. 48).

Cord-impression, although not widespread on the early Woodland level, is nevertheless present in the Baumer series (Sears and Griffin 1950b), penetrating into the south at an as yet uncertain period represented by Gunters and Cormorant Cord-Impressed (Phillips and others 1952, p. 73) and becoming current in later northern Woodland manifestations. Cord-wrapped-stick impression also appears to be localized at an early level, being found in New York (Ritchie 1944, p. 241 for Brewerton; Smith 1950, p. 137 for North Beach) becoming particularly widespread later in the western Woodland complexes.

The conoidal direct-rimmed vessel form is both widespread and early, being characteristic of granular-tempered pottery in the North Beach, Marcey Creek and Dunlap manifestations.

It is interesting to note, in summary, that it is precisely those traits which seem widespread toward the end of the third millennium B.C. in eastern Asia which are best represented in the earliest pottery of North America at a period which radiocarbon dating for the New York area would place between the beginning of the third millennium B.C. (Frontenac 2-2980 B.C. — Johnson 1951, p. 7, Sample 191) and the end of the second (Point Peninsula 1-998 B.C., *ibid.*, Sample 192). Presumably, if the evidence of surface-texturing and vessel form is taken at its face value, our best guess-date regarding the appearance of pottery in the eastern United States would be in the latter half of this span. It may also be observed that such a dating is not incompatible with the appearance of texturing in the Formative levels of the Huasteca and Valley of Mexico areas and, possibly, its as yet undocumented penetration thence through Middle and South America to the Argentinian pampa.

If our hypothesis is extended to include rocker-stamping, the same observation can be made.

In connection with this technique and others, of a decorative nature, such as cord-impression and cord-wrapped-stick impression, it is striking that thin evidence from Asia is paralleled by equally thin early evidence from America, whatever the subsequent vagaries of these traits in the New World. This might suggest that seepage between the two continents, although real, involved, in these cases, traits which were not particularly widespread at their source or on their first introduction in North America. We may be dealing with, as it were, a small leak, the location of which requires closer scrutiny than it has been given heretofore. The same analogy might perhaps be kept in mind in the case of the enormous gaps intervening between the eastern United States and Nuclear

part of the sources. The Japanese sequence, taken from Groot, has been depressed entirely on the basis of two radiocarbon dates given by Johnson (Samples 340 and 603). The alignments suggested here cannot be considered definitive and the presentation for northern Asia as a whole is by no means complete.

America, between portions of Nuclear America itself and between Nuclear America and the marginal areas of South America. Finally, if a distributional argument is to hold, a similar factor must affect our record from Behring Straits to the northeastern portion of the continent. The gap in this case shows certain positive indications of eventually closing. Wintemberg's (1942) map showing the distribution of Woodland finds in Canada tends to reduce the spatial blank we visualize between the Great Lakes and Alaska when we take into account only those areas for which adequate time perspective exists. Incidences of all types of surface-texturing in Alaska, three of them authenticated for the earliest pottery-bearing levels in that area (Larsen 1950, p. 183, for Nanvak Bay cord-marking; Rainey 1941, p. 550, for Okvik simple-stamping; Oswalt 1952, p. 25, for Okvik check-stamping; Giddings 1949, p. 88, for Iyatayet check-stamping and simple-stamping; Oswalt 1952, Fig. 11, for Hooper Bay fabric-marking) tend to reduce the gap for Alaska. However, if intercontinental diffusion did take place, one is obliged to make the rather rash prediction that pottery characterized by at least ten specific traits remains to be found in Alaska in a horizon older by at least one millennium than any of the finds cited above.

It is our opinion that, despite the still staggering inadequacy of some of our information, the case for the diffusion of a ceramic complex in prehistoric times from the Old World to the New is considerably stronger than it was a decade and a half ago. It seems particularly significant that negative evidence is to be found mainly in poorly-known areas and that the occurring gaps affect other traits besides pottery, traits which, within a purely continental framework, are frequently assumed to have diffused. The problem of split distributions in the Americas, arising in connection with subareas within the Nuclear zone (Strong 1949) and more widely separated marginal areas flanking it (Nordenskiöld 1931, Table 1, pp. 7-9 and Appendix, pp. 77-94; Cooper 1942, pp. 25-26) thus has an independent and somewhat less controversial status of its own and involves numerous other traits besides ceramics. The Canadian gap recurs again and again in distributional analyses dealing with the northern portion of North America (Leroi-Gourhan 1946). Finally, other traits besides ceramics may be expected to bear on intercontinental diffusion itself, since Okladnikov, in a monograph unfortunately unavailable in this country but reviewed by Chernetsov (1950) apparently has presented data which lead him to conclude to the existence of contacts between Lena neolithic cultures and North America.

In conclusion, two broad implications emerging from the diffusional case presented here might be pointed out.

In the first place, if we accept the hypothesis that certain pottery techniques diffused in the second millennium B.C. from an area where pottery is probably two millennia old into an area where it seems to be in the process of appearing, the possibility arises that pottery itself, in the Americas, owes its existence to extracontinental influences. It would be futile to maintain *a priori* that pottery can or cannot be invented several times. On the other hand, when chronological data appear to favor diffusion (as they do if one is to accept the evidence of radiocarbon dating), the case for independent invention is weakened. In this light, the early currency of Asiatic models closer to their source of origin, i.e. in North America, and their rarity and spottiness farther away from it make sense. It seems only likely that as pottery penetrated into areas remote from Behring Straits, stimulus diffusion combining with spatial and temporal removal should work to modify and reduce in number features indicative of its origin. This consideration is implicit in Sears' and Griffin's (1950a) interpretation of fiber-tempered pottery in the Southeast where (as in some Formative complexes in Nuclear America) some decorative techniques may be imports but other features must be considered as local responses to outside stimuli. We do not pretend to solve the problem here but merely to suggest that a plausible argument can be presented against the "laboratory" conception of ceramic beginnings in the Americas, and that, therefore, this conception should not be considered at present as entirely secure.

A second important implication of the diffusional argument is that we seem to be dealing here with a diffusion of pottery which, until it reaches an unspecified southern point, is probably disassociated from agriculture. The possibility of this suggests that the formulation of what constitutes favorable preexisting conditions for the diffusion and acceptance of any cultural item cannot be facile if it is to be meaningful.

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AAn	*American Antiquity.* Menasha, Salt Lake City.
BMFEA	*Bulletin of the Museum of Far Eastern Antiquities.* Stockholm.
KS	*Kratkiye Soobshcheniya Instituta Istorii Materyal'noy Kul'tury.* Moscow.
MIASSSR	*Materialy i Issledovaniya po Arkheologii SSSR.* Moscow.
SA	*Sovetskaya Arkheologiya.* Moscow.
SE	*Sovetskaya Etnografiya.* Moscow.
SMC	*Smithsonian Miscellaneous Collections.* Washington.

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CULTURAL SUCCESSION IN THE ALEUTIANS

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PRE-RUSSIAN ALEUTIAN CULTURE was characterized by such typically Eskimo traits as open-sea hunting and the use of kayak-like boats, gut clothing, stone knives, ivory needles with eyes, labrets (probably introduced from Northwest Coast cultures), circle-and-dot design, and others. There is evidence that in the eastern Aleutians the culture was most Eskimoid during the early phases and gradually a somewhat more differentiated Aleutian type developed under the influence of the environment. A number of traits, such as whale poisoning with aconite and the use of the semi-subterranean, sod-covered house with entrance in the top, are recognized as probable direct Asiatic transfers (Heizer, 1943). The Aleut population numbered 16,000 or more persons prior to 1741 (Kroeber, 1947), and the villages, most of which were situated close to shore, occupied the majority of more than sixty islands comprising the archipelago. Abandoned sites often remain as imposing mounds whose archaeological deposits may be more than thirty feet thick. These deposits show a stratigraphy that is frequently complicated in the extreme, for not only are cultural levels interspersed with ash and humic layers, indicating intermittent occupation of the site, but also the large mounds are formed from thousands of individual trash piles, which show up in the profile as corresponding lenses of sea urchin and clam shell, compacted fish bone, snail shells, sea-mammal bones and vegetable remains (Bank, 1953a). Interpretation of the stratigraphy, therefore, is a difficult problem, made worse by the large variety of artifacts which sometimes comes from a single excavation.

* Field Director, University of Michigan Aleutian Expeditions 1948-52. The expeditions have been sponsored by the Botanical Gardens and the Museum of Anthropology of the University of Michigan with funds received from the Office of Naval Research and the Michigan Memorial Phoenix Project. I am grateful for this support which made the expeditions possible, and also I wish to thank H. H. Bartlett, J. B. Griffin and A. C. Spaulding of the University of Michigan and Frederica De Laguna of Bryn Mawr for reading this manuscript and offering their criticisms.

CURRENT STATUS OF ALEUTIAN WORK

An admirable statement of the current status of Aleutian archaeology is given by Spaulding (1953). Briefly, cultural succession was thought by Dall (1877) to extend through three periods, dominated, respectively, by three different types of food economy, namely littoral, fishing and finally hunting. Jochelson's much more substantial field work (1925) led him to the conclusion that while there had been cultural development in the Aleutians it was impossible to delimit strictly defined periods, certainly not any such periods as proposed by Dall. Nor had there been such radical changes in the substratum as Dall suggested. Jochelson dug at both very old and quite recent sites judging from the specimens he has pictured in his report.

The most extensive field work was conducted by Hrdlicka during 1936-38. His archaeological data are less useful than Jochelson's, but he collected from many more sites ranging across the entire Aleutian Chain and succeeded in assembling a large body of skeletal material, which he proceeded to sort into two groups based upon morphological differences. One group had distinctly broad heads and the other comparatively long heads with accompanying long bone differences in size. From this he inferred that there had been two migrations of physically distinct people into the Aleutians, the first composed of "Pre-Aleuts" who were followed a thousand or so years later by the "Aleuts." He failed, however to find an accompanying abrupt change in culture upon the arrival of the later people. Unfortunately, Hrdlicka kept inadequate field records, and his large skeletal series must be viewed with considerable reservation because he pooled the skeletons without any regard for excavated depth or cultural association (Laughlin, 1951, pp. 100-103).

A recent examination of Aleutian artifacts by Quimby (1946, 1948) has led him to return to the concept of three periods, which, however, are not generalized culture periods but rather stages in the development of artifactual types. His view is that both culture and physical type changed gradually during the occupational span (Quimby, 1948, p. 77), which, as will be pointed out later, is a view that can be supported by archaeological evidence at hand.

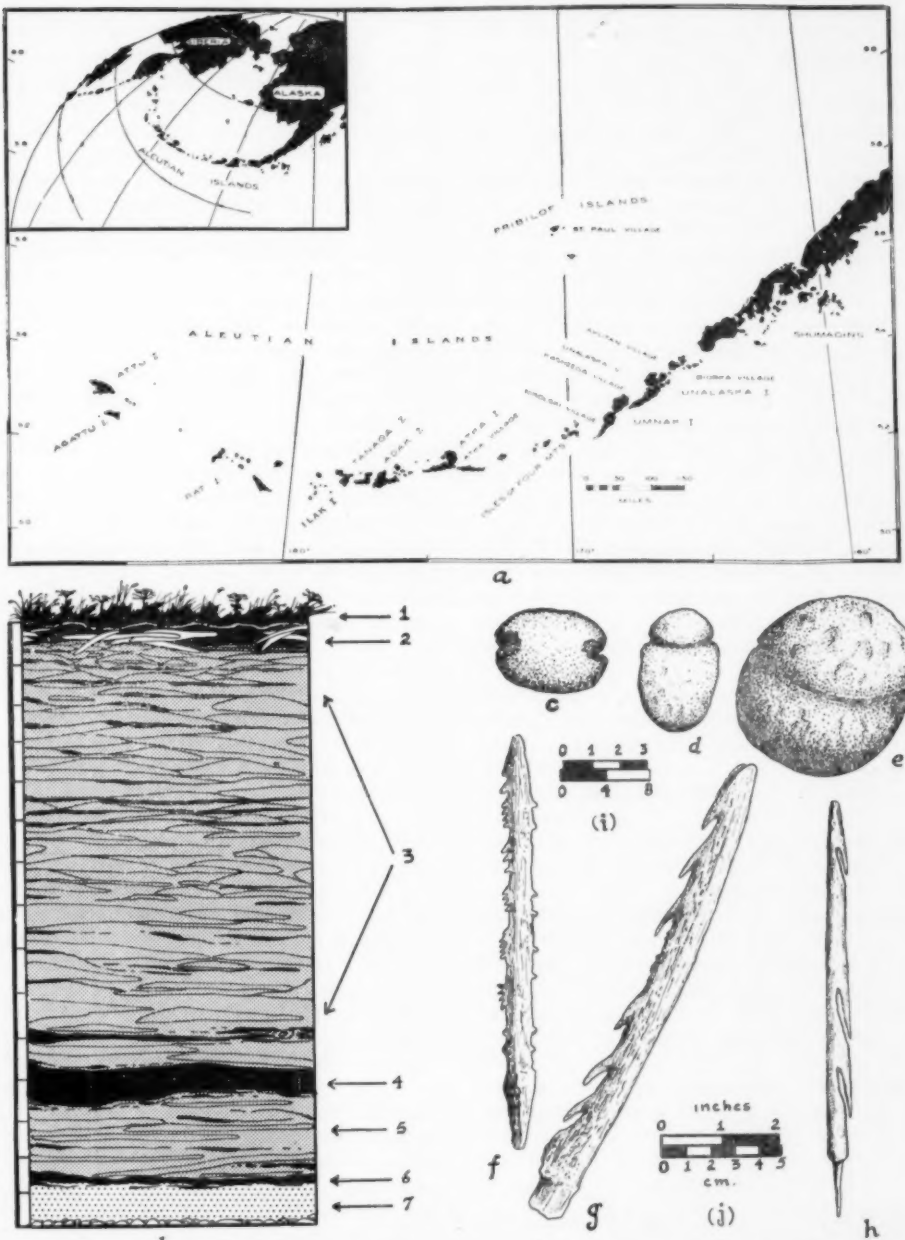

FIG. 16. *a*, The Aleutian Islands; *b*, diagrammatic profile, Eider Point mound, Unalaska; *c-e*, stone fishline sinkers from Amaknak (left), Chernofski (Unalaska), and Agattu (right); *f-h*, typical bone lance heads from Amaknak (left), Unalga in the central Aleutians, and Attu (right) in collections at the U.S. National Museum and the Alaska Museum. Scale (*i*) is for stone sinkers, and scale (*j*) is for lance heads. Scale interval for profile is 2 ft.

More recent still is the work of Laughlin and his associates. Laughlin shows that the two morphologically distinct physical types noted by Hrdlicka among the skeletal series also exists among the living population on a geographical basis (Laughlin, 1951), the dolicephalic type in the west and the brachycephalic in the east. Laughlin's view of Aleutian cultural succession is almost identical to that of Hrdlicka's. He writes (1951, p. 103): "More recent researches have demonstrated the existence of at least two cultural periods, stratigraphically superimposed." Later, he modifies this view somewhat but still retains in essence what Hrdlicka proposed (Laughlin and Marsh, 1951, pp. 82-4): "The artifacts fail to show a sudden change with the new arrivals, from which one may judge that the two populations had similar cultures and that whatever innovations the new people brought filtered west more rapidly than the population itself. Thus, though there are no sharply marked periods in Aleut prehistory, there are two periods in the sequence of population in the eastern sector of the Aleutian Islands, which are less noticeable in the western Aleutians." Paleo-Aleut and Neo-Aleut are substituted for Hrdlicka's terms, Pre-Aleut and Aleut.

In addition to the recent work of Laughlin and his colleagues, archaeological excavations have been undertaken in post-war years by Spaulding and me. Spaulding completed an excavation at Krugloi Point (Agattu island). I excavated in two large mounds at Eider Point (Unalaska island) and Amaknak (Dutch Harbor, midden D referred to by Quimby, 1946, 1948). Other excavations, these of a minor character, were made at village sites on Tanaga, Adak, Atka and Umnak islands (Fig. 16, *a*), and in addition we conducted studies at burial caves on four islands (Bank *et al*, 1950). Currently we are studying our material and can only offer preliminary impressions, but full reports of each excavation will be published. These will include radiocarbon dates for samples secured stratigraphically with accompanying notes on pollen analyses.

Burial Caves

Data from the burial caves are sufficiently important to require treatment in a larger report, which is forthcoming (Bank, n.d.), but in general, excavation below levels previously examined by Hrdlicka and others in the same caves seems to substantiate Hrdlicka's contention that the use of caves for mummy burials was a comparatively late trait in the Aleutians.

Aside from skeletal remains, abundant wood, and grass mummy matting, the lower subsurface levels of a Kagamil island cave yielded carved bone drum handles, single piece socket receivers with bifurcated butt, harpoon toggle heads with closed socket, symmetrically barbed harpoon heads with ownership marks, asymmetrically barbed bone spear heads with shouldered tang, and ivory labrets (Fig. 17, *a-e*) — all considered to be fairly recent elements of Aleutian culture (Laughlin and Marsh, 1951). Below these remains were found a number of small, well-made, chipped basalt blades and points overlying the basement rock of the floor (Fig. 17, *f, g*), and these may represent a basal complex of artifacts which indicate an early use of the site previous to the burials. On the same island a small, newly discovered cave adjacent to the mummy caves contained an extremely interesting single burial with an associated artifact complex that included fragile wooden masks, faceless wooden figurines, a shell pendant and several chipped stone blades (Fig. 17, *h-l*). There were no bone implements, and no matting or other evidence of mummification were found, which may mean that this burial was made prior to the introduction of the custom of mummifying the dead. The custom is thought to have been a late trait and confined to the eastern Aleutians (Hrdlicka, 1945). There are, however, reliable reports of mummy caves on Kanaga island, and in addition we found abundant grass matting in a cave on Tanaga, so the custom probably reached at least as far as the central Aleutians. (There is an alternate suggestion [MacLeod, 1925] that mummification entered North America from the North Pacific Asiatic Coast, possibly via the Aleutians.) In the same cave on Tanaga, fire blackened stones, charcoal, sea urchin shell, clam shell and fish bone deposits point to the use of the site for living quarters, not a usual practice among the Aleuts, who did not ordinarily inhabit the caves but preferred to construct semi-subterranean houses.

Unalaska Bay

Our most interesting material comes from two sites in the Unalaska Bay area in the eastern Aleutians which were excavated during two summers, 1950 and 1951. A refuse heap

30 feet deep at Eider Point yielded artifacts essentially unlike those recovered from the nearby Amaknak-D excavation, which was 20 feet deep. The stratigraphy at both mounds was similar, except that at Eider Point a thick, culturally sterile humic layer located about six feet above the old cobble beach separated the lowest cultural levels from those above (Fig. 16, *b*). Presumably there was a considerable period of time when the site was abandoned, but any evidence of a major cultural change above the humic layer is totally absent, so that one must assume that the later occupants had essentially the same cultural background as the first inhabitants at Eider Point. No skeletons were recovered, unfortunately, and another field season should be spent at the site in order to see it in the proper perspective with Amaknak-D. Forthcoming radiocarbon dates from both sites should prove very interesting. We hope to be able to obtain dates for levels at Eider Point before and after the period of abandonment.

Amaknak-D cultural deposits lie upon a basement of medium-sized beach boulders, coarse pumiceous ash and some humus. Aside from skeletons, food refuse and worked artifacts, the mound contained many fire-blackened, flat stones and large whale bones. In the lowest cultural stratum, we found numerous chipped stone points, blades, scrapers and miscellaneous fragments (Fig. 18, *m*, *n*). Small, finely-chipped, lanceolate points, like Ipiutak type 1 (Larsen and Rainey, 1948, Fig. *22b.*), appeared in the middle levels, which also contained tiny chipped points only a few centimeters long (Fig. 18, *g*, *h*). In general, chipped artifacts were better made in the lower half of the site and cruder in the upper half (Fig. 18, *a*, *b*, *m*, *n*). Cape Dorset type "crooked" knives (Jenness, 1925, Fig. 4, *i*) lasted until the middle stratigraphic horizons and then disappeared (Fig. 18, *i*). Slate entered as a late element (trade material from Kodiak or the Alaska mainland) near the top of the site. Numerous stone fishline sinkers of crudely chipped beach cobble and resembling those from Cook Inlet (De Laguna, 1934) were found throughout the mound, but they are somewhat larger from middle levels. Stone lamps in later times were generally flat, shallow and better made than the round bottomed, crude lamps from earlier cultural strata. In terms of quantity, more stone materials, i.e., stone points, blades, scrapers, sinkers, hammers, and lamps, occurred in the upper two thirds of the mound, and more bone artifacts, i.e., bone harpoon heads, lance heads, pendants, etc., in the lower two thirds, although this may have but little significance.

Many different types of harpoon and lance heads are represented in the Amaknak-D assemblage, and some of the types have many varying styles. No one style lasted very long. Apparently type changes also occurred frequently throughout the occupation of the site. Early bone harpoon and lance heads are characterized by conical tangs and numerous asymmetrical barbs, i.e., long barbs on one side and many small barbs arranged oppositely or alternately with the longer barbs (Fig. 18, *o*, *p*, *s*). The conical tang also occurs in the middle horizon where it is associated with a distinctive slim, sharply barbed (asymmetrical) arrowhead which resembles a late type at Port Möller (Weyer, 1930, Fig. 19) and which is somewhat reminiscent of Ipiutak type 3 (Larsen and Rainey, 1948, Pl. 33). Lance heads from the lower cultural levels frequently have shallow end beds for holding a small stone point, whereas this feature is lacking among the later types. One small arrowhead from near the top of the site has a slot for blade insertion. Harpoon and lance heads from the middle and upper parts of the mound have wedge shaped tangs, often shouldered tangs, and fewer barbs than the earlier types (Fig. 18, *d-f*). Early lance heads are usually long and slim, but those from the middle levels of Amaknak-D are frequently large and heavy, with symmetrical barbs (Fig. 18, *j*). Barbs arranged unilaterally are a feature primarily of the later period of occupation at Amaknak-D, and arrowheads without barbs also appear late. Double socket receivers for harpoons are found in the early horizons and are replaced later by the single piece socket receiver (Fig. 18, *c*, *l*, *q*). Numerous bone wedges occur throughout the site. Most of these show evidence of secondary use as drill bases (Fig. 18, *k*). In general, art styles are much the same as those reported by Quimby (1948). The circle-and-dot motif appears fairly early, in the lower part of the middle culture zone. A beautifully carved ivory figurine was recovered from one of the lower levels (Fig. 18, *r*). Its facial features strongly resemble those on a carved bodkin figured by Laughlin (and Marsh, 1951, p. 38) from the Chaluka site on Umnak. In general, art is poorly repre-

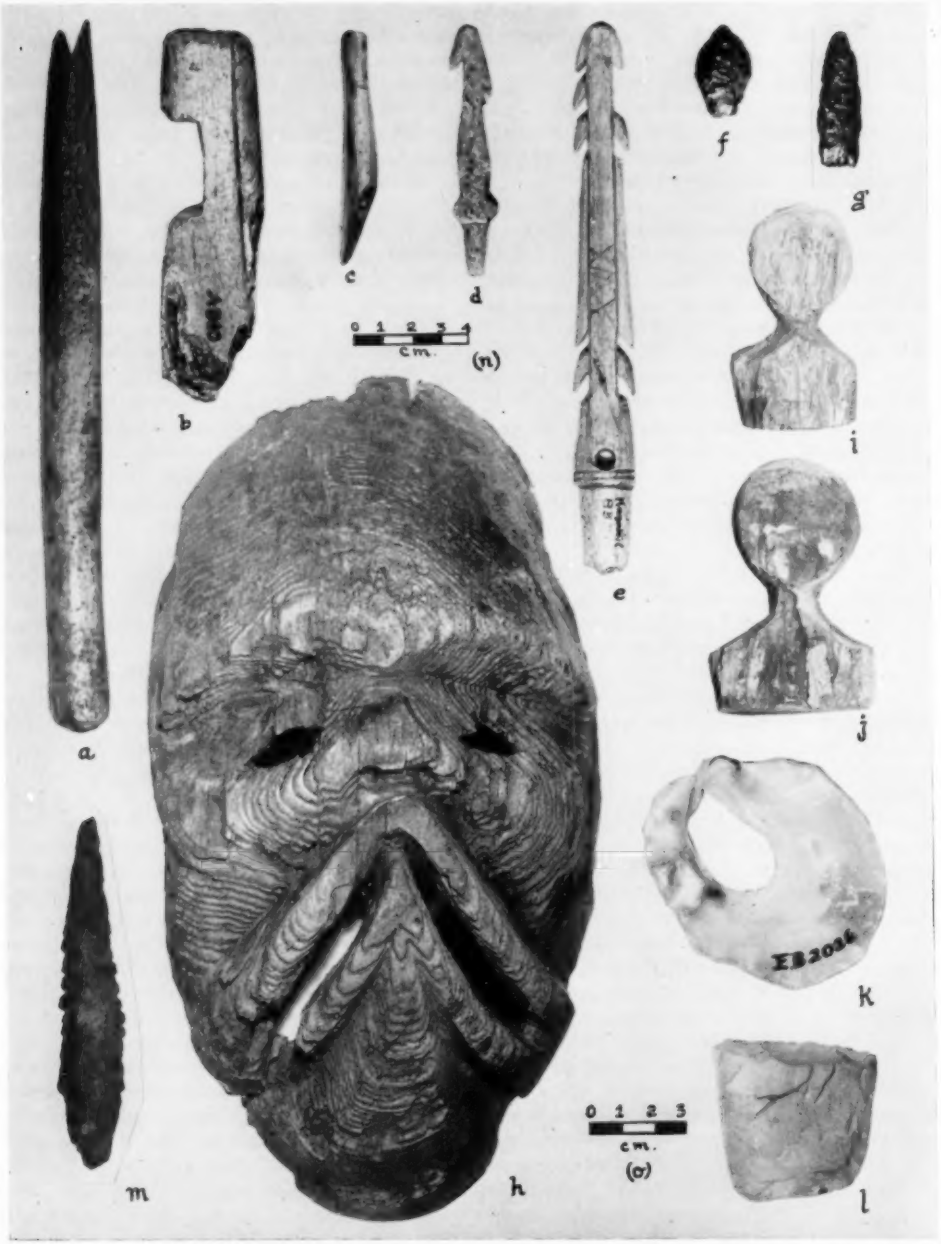

FIG. 17. *a-g*, Artifacts from the lowest levels of a cold cave on Kagamil, (left to right) single piece socket receiver, drum handle, harpoon toggle head with slot for blade, asymmetrically barbed point with shouldered tang, war lance head, basalt and obsidian points overlying basement rock; *h-l*, artifacts from mask cave, Kagamil, (left to right) mask, faceless wooden figurines, shell pendant, and basalt blade fragment; *m*, argillite point from Agattu. Scale (*o*) is for mask only.

sented in the upper cultural levels at Amaknak-D but is concentrated more in the lower half of the mound, although the middle cultural horizon is richer and more diversified than either the underlying or overlying horizons. A most significant thing about the cultural sequence at Amaknak-D is that despite the diversity and numerous changes of types of artifacts throughout the occupation, there is no level at which several changes of type occur simultaneously in a number of different artifacts. It is therefore impossible to define any strict cultural periods marked by the synchronous appearance of a number of artifact types. There apparently was no abrupt interruption of the developmental trends during the time span at Amaknak-D.

Since full reports are not yet available for either our site at Amaknak or Laughlin's on Umnak island, any comparison of artifacts will be restricted to the few types which Laughlin has described. Of the artifacts which can be compared, both early and late types from Chaluka (Umnak), which has a radiocarbon dating of about 3,020 years (Arnold and Libby, 1950, p. 13), are represented in the lower cultural levels at Amaknak-D, but in numbers there are more early types than late. This would tend to indicate that the Amaknak site, too, may be quite old. On the contrary, crania from Amaknak's early levels are broad and would probably have been classed by Hrdlicka with his Aleut skulls as contrasted with the so-called Pre-Aleut crania. Thus, if the skeletal types were truly valid indicators of gross cultural age of sites throughout the eastern Aleutians, Amaknak would be called recent despite evidence to the contrary from the artifact series.

Geographical Distribution of Artifacts

An examination of the many artifacts which have been collected by various professional and amateur archaeologists who have visited the Aleutians is well worth while, despite the unfortunate lack of provenience data for most collections. Such a study reveals something of the geographical distribution of types. (Jochelson [1925] gives excellent figures for such a study. In addition I have had the opportunity to examine specimens in the U. S. National Museum, the American Museum of Natural History, and in numerous collections of Aleutian artifacts excavated by military personnel and casual visitors to the Islands.) It becomes evident that there was considerable cultural diversity throughout the Aleutians, and perhaps there are more local expressions of Aleutian culture, differing from the regional picture, than have generally been recognized.

People at opposite ends of the archipelago should have developed dissimilar cultures if for no other reason than because of the great distance, almost 1,000 miles, separating them during most of their history. However, very important differences in artifact types and styles also appear in cultural assemblages from presumably contemporary levels on adjacent islands. At Krugloi Point, Agattu, there is a notable abundance of chipped stone tools in contrast to the few implements of bone, but sites on nearby Attu frequently contain a considerable quantity of bone and ivory artifacts. Bone implements predominate at most eastern Aleutian sites. A unique cultural feature at Agattu is the argillite industry which is best represented by a long, narrow, well-made, chipped argillite point without a tang (Fig. 17, *m*). This type is encountered on several other of the Near Group but is totally absent from the eastern and central Aleutians. Western islands in general have stone fishline sinkers made from large, round beach cobbles which have been partially or entirely grooved around the middle, but eastern sinkers are usually small and made from flat cobbles. Some of the eastern sinkers are grooved in the manner of the western ones, whereas at other sites they are eccentrically grooved around one end of the stone, which is oblong shaped. A third kind, common on some eastern islands, resembles the Amaknak stone sinker; it has no groove but is only chipped in a crude fashion on two edges (Fig. 16, *c-e*).

As has already been pointed out, artifacts from Eider Point are dissimilar to those from Amaknak, although the two sites are separated by only a few miles of water. None of the bone wedges at Eider Point, e.g., shows drill holes so characteristic of Amaknak-D and also found at Umnak and Attu (Jochelson, 1925, Pl. 27). Bone arrowheads without barbs are numerous at Eider Point and occur from bottom to top, but this is not so at Amaknak-D. Notched stone sinkers, common on Amaknak island, occur infrequently at Eider Point. In this instance the two sites were probably not inhabited contemporaneously. Possibly Eider Point was inhabited earlier, then abandoned for a long time and reoccupied later. At least the stratigraphy

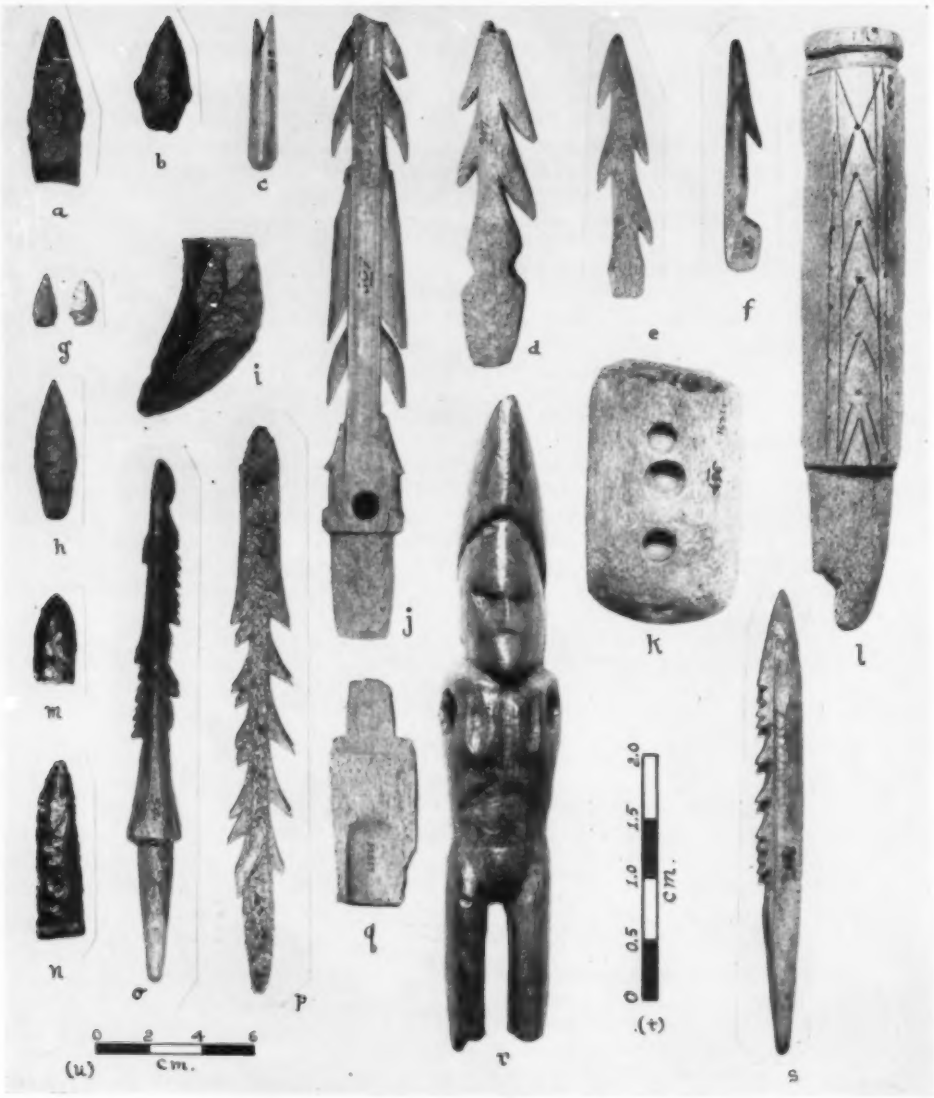

FIG. 18. *a-f*, Recent artifacts from Amaknak-D, (left to right) basalt points, single piece socket receiver, barbed spear heads; *g-l*, artifacts from middle levels at Amaknak-D, (left to right) small basalt points, Ipiutak-I type stone point, Dorset-like "crooked" knife blade, bone lance head, wedge with drill holes, double piece socket receiver; *m-s*, artifacts from lowest levels, (left to right) obsidian points, harpoon head with conical tang, asymmetrically barbed spear head with end bed, double piece socket receiver, ivory figurine, and asymmetrically barbed head. Scale (*t*) is for figurine only.

indicates such a history. The upper levels at both sites seem to be contemporaneous. Many sites which possess different cultural manifestations cannot be as easily related chronologically, but the differences must be explained by geographical variations and maintenance of local traditions. Stone points from Attu and several other western islands, for example, frequently possess two pointed shoulders or flaring barbs and a rounded tang (Jochelson, 1925, Fig. 13), whereas this type is seldom encountered in the eastern and central Aleutians. Very large, chipped andesite knives seem to be especially characteristic of certain sites in the Fox Island Group (Hrdlicka, 1945, p. 446). A small adze blade is found on Unalaska island but is apparently rare elsewhere. There are harpoon head styles which seem to be characteristic of certain groups of islands (Fig. 16, *f-h*). Other styles are even more restricted, i.e., to a single island or to individual sites, although this may merely reflect the lack of enough archaeological studies.

The total number and variety of artifact types differ from site to site. Certain islands or island groups seem to have been local centers of cultural development. There were probably genetic connections between most of these local flourishing cultures, but the amount of stimulation from the outside varied, and some groups probably were little influenced by any others. Geographical isolation undoubtedly was an important factor in preserving local stylistic changes, especially in the western Aleutians where great expanses of water between islands no doubt restricted inter-island contact.

Many sites, including some large villages, are particularly unproductive of artifacts and fail to show much evidence of cultural development or change. (Spaulding found very little evidence of cultural change throughout the occupation span at Krugloi Point, Agattu (Bank *et al.*, 1950, p. 183), which has an early date of about 2400 years by radiocarbon determination.) Jochelson probably emphasized these sites in his interpretation of Aleutian prehistory, for he concluded that cultural development had been slight. Although the situation is somewhat more complex than he supposed, it is nevertheless true that despite the size and depth of some sites and the diversity of types of materials present in many refuse heaps, major type and stylistic changes at any one site are few. Many elements occur without alteration throughout the cultural sequence. There is some indication that sites widely separated, e.g., at opposite ends of the archipelago, are more unlike each other culturally at any level than are the bottom and top strata at any single site.

POPULATION MOVEMENTS

The current theory of Aleutian prehistory proposed by Hrdlicka and supported recently by Laughlin recognizes two distinct migrations of people into the Aleutians at widely separated intervals of time. However, archaeologically the role of the second migration in Aleutian cultural succession is hard to demonstrate, for the later wave cannot be marked with certainty in the stratigraphic sequence. From the failure of the archaeological evidence to provide proof of two culture periods, both Hrdlicka and Laughlin have concluded that the later Aleuts arrived in the Aleutians with essentially the same type of culture as that possessed by the Pre-Aleuts who preceded them by a thousand or more years. The distinction is based primarily upon skeletal remains which can be separated into two groups morphologically different from each other. The two skeletal types are presumed to represent the populations of two Aleutian migrations.

Prior to Laughlin, Dr. Hrdlicka seems to have been the only anthropologist to recognize the existence of two distinct physical types in the Aleutians, but, as has been pointed out, he failed to keep a record of the stratigraphic relation of the two types. Jochelson recognized that the Aleut population had been a heterogeneous one physically but did not go so far as to separate the Aleuts into two immigrating groups.

One cannot overlook entirely the possibiliity that arbitrary selection, not stratigraphic separation, is the basis for delimiting two skeletal series from the Aleutians. Laughlin's work has been almost entirely at the Chaluka site on Umnak (Fig. 16, *a*), which he admits is practically all Paleo-Aleut. His one clear statement which leads one to hope that he has more data to clear up the confusion is (Laughlin, 1951, p. 102), "In the Nikolski [Chaluka] site on Umnak only Pre-Aleut skeletons were found in the Pre-Aleut levels and the few Aleut skeletons recovered all came from a later portion of the site. However, Pre-Aleut skeletons are found from top to bottom." Comparative num-

bers of skeletons are not given. Presumably the forthcoming full archaeological report on the Chaluka site will give this information, with stratigraphic data. It seems important that other intensive excavations should be made on islands ranging across the archipelago in order to corroborate for the entire Aleutians the interpretation which Laughlin has given based upon his observations at Umnak, and that the sites should be chronologically dated.

Although the hypothesis of two migrations accounts for the evidence from physical anthropology, there is nevertheless an alternative interpretation, one which is just as valid on the basis of present data. The two morphologically segregated groups of skeletal material which have been cited by Hrdlicka and Laughlin may actually represent different parts of a single population that early spread out along the Aleutian Chain and became separated geographically. Both ends of such a linearly expanded population were comparatively isolated from one another, and, during three or more thousand years of occupation, they may have developed along diverging lines, culturally, physically and linguistically. Physically this could happen by gene drift or just through the accident of certain populations being descended from small, non-median, inbred migrating groups, perhaps family groups, whose physical traits would have been carried down to their descendants simply because of the prevalence of certain genes. Such groups may possibly have been too small initially to be genetically random samples. Divergence of physical characteristics may have been effectively increased through more frequent mixing between eastern Aleuts and mainland groups than was possible for the more isolated western Aleuts. Thus, changes in physique would be greater in the eastern Aleutians than in the west during the long period of occupation. The skeletal type at Amaknak-D, e.g., would not necessarily be expected to resemble too closely the type from Nikolski if it could be shown that opportunity for outside marriage had been different in the two communities. In the eastern Aleutians outside influence may have been comparatively stronger in later times, and indeed the archaeological evidence supports this idea, but a second immigration by groups of new people is not necessary. Rather one might assume a more or less continuous ebb and flow of cultural and genetic exchanges in southwestern Alaska and the eastern Aleutians. The round-headed Aleut physical type would not necessarily represent a later incoming population but instead an offspring of an original genetic mixture which was simplified by random selection of an extreme in the supposedly small family or related family groups that moved westward. The pattern of human economy changed more rapidly in some parts of the archipelago than in others. For example, a greater wealth of natural resources developed in the eastern Aleutians in late postglacial times than in the central part. Geographic alteration of culture continued throughout the occupation by selective diffusion across numerous ecological filters. Local strife, geographic isolation and severe climate created temporary barriers to culture spread, and, conversely, warfare and slave capture between certain groups who became traditional enemies served to mix genes. Thus, small eddies became established in the main current of cultural diffusion, which of course worked in both directions, and tended to break up Aleutian culture into geographical entities, each of which developed along slightly divergent lines. Since many culture ripples may be presumed to have approached the Aleutians from the outside, some sites show numerous minor changes in type and style of the artifacts. However, such diffusion would not necessarily show in the stratigraphic sequence by any abrupt major cultural change bringing about generalized cultural periods everywhere the same along the far reaching archipelago.

Conclusions

In conclusion it should be stated that very few sites in the Aleutians have been excavated stratigraphically, and as yet no interpretation of Aleutian prehistory can be said to be founded upon a wealth of evidence. There is still room for more than one explanation for the facts which Aleutian archaeologists have gathered. Furthermore, it is conceivable that the prehistoric sequences at one site, no matter how large and ancient that particular site may be, do not necessarily reflect the prehistory of the entire Aleutians. There should be a re-examination of the archaeological data already assembled to learn more about geographical variation of Aleutian culture, and, most important, more work must be done at stratified sites ranging across the entire archipelago.

A more favorable atmosphere for an ultimately correct understanding of Aleutian prehistory might be gained if local terms were

used in describing whatever cultural phenomena are found at individual sites rather than names for generalized cultural periods which are meant to apply to the entire region. Early Atkan and late Atkan, e.g., may or may not correspond to early Attuan and late Attuan, but such terminology would not, in any case, restrict a comparison of cultural remains from sites on the two islands as do the all inclusive terms Paleo-Aleut, Neo-Aleut and Pre-Aleut. When considerably more data are at hand it will be time for correlating all sites and traits. At present writing, however, a final summation of Aleutian cultural sequences seems far beyond the immediate future. Forthcoming reports of archaeological work may clarify the picture of Aleutian prehistory, but these reports will be most useful if workers avoid semantic juggling and too hasty conclusions in favor of a new examination of data site by site.

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MODERN AND ANCIENT SOILS AT SOME ARCHAEOLOGICAL SITES IN THE VALLEY OF MEXICO *

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IMPRESSIONS OF PAST CLIMATES on soils and soil materials are not easily obliterated by time. Morphological and chemical features of the weathering record may be of considerable aid in reconstructing the past environments as well as in understanding the present ones. It should be possible not merely to recognize the qualitative aspects of the past climates, by the morphological-geochemical analysis, but also to attempt establishment of semi-quantitative time scales, of indices of the duration of this or that component of the climatic sequence. This analytical approach to the study of ancient soils, palaeopedology, is now at its beginning. The large but disorganized body of observations and data in this field is still lacking in perspectives and interpretations. The tentative conclusions developed herein are subject to revision and change, and it is our hope to verify and to enlarge this study in the near future, time and opportunity permitting.

The present report is a small addition to the body of palaeopedologic observation, an outcome of one week's reconnaissance in the Valley of Mexico. Some of the premises of the geochemical method in archaeology are stated in Sokoloff and Carter (1952) and others are to be developed in a more detailed work now in preparation. The following five sites in the Valley of Mexico were sampled for detailed soil analysis:

Tepexpan Man Site. A pit about 50″ deep revealed five levels of soil differentiation including muck at 50″ below the ground surface. Remains of man were found in the fourth horizon at a depth of 34″ to 50″.

"Elephant Site." A rectangular pit *ca.* 6′ deep showed six soil strata with mammoth bones present in the lowest horizon which was 80″ below present ground surface.

Zacatenco Beach. A road-cut in a hill slope just off the highway east of Mexico City but within the city limits showed pottery fragments and bones almost throughout its seven soil horizons indicating repeated human occupation from near the base upward.

Totolzingo Slopes. A rectangular pit *ca.* 9′ deep recently excavated in construction of a new power line revealed scattered fragments of pottery on the surface but otherwise presented no evidence of human occupancy in any of its five levels of soil differentiation.

Totolzingo Slopes, "A". *Ca.* 600′ east of Totolzingo Slopes, exposures in a recently excavated rectangular pit *ca.* 10′ deep showed two (?) fossil beaches. There were eight distinct levels of soil stratification.

Soil samples from each horizon within all of the five sites described were collected, dried in the laboratory, and examined for chloride, sulphate, bicarbonate, carbonate, extractable copper, and in some instances for zinc, gold, or other constituents. Results indicated that further work on pedogenesis in Mexico Valley should be centered on the clay-bound and humus-bound forms of both copper and zinc with attention to the other forms of these metals. Therein lies one of the keys to the rates of pedogenesis in the Valley and also a rational approach to the reconstruction of the past climatic environments.

A short review of pedogenesis in parts of the Valley of Mexico examined would be in order here, despite the necessary limitations and even errors inherent in such an attempt. The review is based entirely on observations made in the field and needs further verification, both by further field study and by correlations with findings of other investigators.

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Editor's Note. This comment constitutes an abridgment of a much longer article. The portions deleted were concerned chiefly with techniques and highly specialized pedological descriptive notes.

In this region the *parent material* subject to recent pedogenesis is relatively uniform, both mineralogically and chemically. It is chiefly alluvium or sediments derived from intermediate to basic volcanic rock (andesite to basalt) composing the surrounding slopes. Some siliceous volcanic rock (rhyolite) is also present in the area, as well as a number of other kinds of rock and soil-forming materials, all in subordinate proportions. There seems to be a rather high degree of mixing of all of these, in the flatter parts of the Valley.

Texture of the lake deposits undergoing pedogenesis at this time is relatively uniform. It is chiefly loam sandy to silt-like in texture, varying somewhat in its grading and structure. Quartz sand is very rare in the Valley; its noticeable accumulations, however small, appear to be confined to margins of old lakes and to small pockets in the alluvium.

Clay-sized particles are not prominent in any but the most ancient lake sediments and in some volcanic ash falls. Gravels are rare, except as described. Organic residues are present in small amounts in the surficial layer of modern soils and in the humus-conserving calcareous environment, appearing to be of minor consequence in the modern pedogenesis.

Calcium (as much as 6%), magnesium, potassium, and sodium are conspicuously high in the andesite rock and in the alluvium derived from andesite and basalt. Both the alkaline earth and the alkali bases are in positions quite accessible to the weathering solutions. The most visible sign of modern pedogenesis accordingly is the sorting of Ca, Mg, Na, Co_3, SO_4, and Cl in the weathering zone. Thickness and extent of the weathering zone are determined chiefly by the depth of the rainfall penetration.

The *weathering environment*, as defined by the depth of penetration of atmospheric waters (24" mean annual rainfall, almost entirely from May through November) and the consequent depth of the feeder root penetration of the Recent higher flora, does not seem to exceed 1.5 feet, on the average, tending to be about 0.7 foot or so. There is evidence of a deeper penetration of the atmospheric waters, however, in places where additional water is received as the run-off from the higher ground, a penetration sufficient to calcify the lower horizons of the polymorphic soil mantle of the Valley. The ground water table appears to be at about 6 feet or deeper, in the flatter parts of the Valley examined. The relatively coarse texture of the sediments and the interphase effects do not afford capillary rise of the ground waters to any significant extent. (A stability of the present ground water table and also of the former lake levels is suggested by the practical absence of the mottled or concretionary horizons anywhere in the soil section so far examined, including the pluvial horizons. This may be due also to the anti-hydrolytic effects of the alkaline earth bases as well as to the long periods of climatic stability.) The weathering solutions, on penetrating a certain depth consistent with the field capacity of the soil, become largely evaporated during the dry season, partly by a limited capillary rise from the shallow depth of their initial penetration, partly by the transpiration of plants, and partly by aeration of the soil itself. (This limited capillary rise may be cut down remarkably if the topmost layer of the soil is or is rendered structureless, even for the fine sandy loam textures. The effects resemble the well known conservation of moisture by some desert sands.) The characteristic distribution of CO_3, SO_4, Cl, and the pH and the morphologic evidence lend further support to this view.

Chemical composition of the weathering solutions is determined chiefly by solutes already present in the soil or the parent material, in contrast, for example, with the Chesapeake Bay margins, where it is determined chiefly by the cyclic salts (Carter and Sokoloff, 1951).

The prevailing Recent temperatures are said to be rarely over 85° F. during the warmest months of the year, toward the end of the dry season, with nightly average minima rarely less than 55° F. Both colder and warmer temperatures have been recorded. The Recent thermal regime appears to be very much the same since the cold pluvial maxima of the Wisconsin, judging by the structure of the ancient soils so far examined.

The present vegetation of the uncultivated flatter parts of the Valley is chiefly shallow-rooted tough lawn-like grass, some cactus, shrubs, and trees, most of which are said to be introduced by man within historic times. It should be noted that the feeder roots of shrubs and trees (excepting the mesquite, perhaps) are essentially within the zone of the rainfall penetration, i.e., the zone also of the grass roots, although their larger roots are able locally to penetrate much greater depths.

Thus the modern pedogenesis is taking place in a preponderantly calcareous environment, in the presence of highly saline weathering solutions, in the time-space of a well defined sequence of arid and rainy seasons, at moderate temperatures, within a relatively shallow depth and in the practical absence of leaching, at very low hydrogen ion levels and with a very limited participation of organic substance. This type of an environment is not conducive to rapid pedogenetic differentiations. Quite the contrary, the saline-alkaline-calcareous periodically arid environment is adverse to the clay mineral synthesis and to the development of texture profiles. (The common vertical differences in the texture of Recent profiles are due to a slight wind-sorting of the topsoil materials.)

On the other hand, the modern environment is conducive to the formation of structure profiles and to the characteristic distribution of salts within the weathering zone. It is conducive also to a salinization of the originally nonsaline deeper layers of the polymorphic soil mantle which, in turn, may have certain diagenetic manifestations in the clay complex of the latter, very much like the imposition of Recent salinity on some leached ancient clays in Lake Bonneville Basin, Utah as set forth in Hunt and Sokoloff (1950).

Modern Soil Profiles. The presence of a caliche layer is typical in all flat terrains of the Valley so far examined, a blocky highly calcareous soil horizon, at depths rarely exceeding 1 foot. On the higher slopes, however gentle, bordering on the Valley, the caliche layer is exposed in many places and is undergoing erosion. This general occurrence does not mean necessarily that the caliche on the higher ground is "out of equilibrium" with the environment, in the zonal sense. It means rather a local disequilibrium due to the accidents of the topsoil erosion, accidents caused by nature as well as by man. Such local reversals or modifications are very common in pedogenesis in all climates. They are mistaken for a "normal" destruction of relict horizons by some pedologists. My contention here requires no further assumptions. An opposite view, namely, that the caliche on the slopes is a relict, would require a number of difficult suppositions regarding the past environments, etc., all on the basis of one single premise, namely, the present visible destruction of the caliche. It should be added that, as the slope caliche is being eroded, a part of its lime is obviously migrating downward where it is forming a new caliche, all within the time-space of the zonally stable Recent. The remarkable coincidence regarding the caliche examined is its high content of both chloride and sulphate (in contrast with the Lake Bonneville, where carbonates, sulphates and chlorides are much better sorted). The correspondence of the Cl and the SO_4 peaks with the carbonate peak, if sustained by further studies, would suggest an uncommon uniformity of the rainfall distribution in the wet seasons, a slow pedogenesis, or a very short duration of the pedogenesis. The latter possibility appears to be difficult to harmonize with the generally mature structures of the caliche horizons. The possibility of calcareous horizons formed subaqueously, in shallow waters, with or without participation of biological agencies, remains to be investigated. The high copper content of both Tepexpan and Elephant caliche deserves further studies, in this connection. These and other possibilities illustrate the necessity of detailed geochemical investigations in all chronologic-pedogenetic research, to supplement the purely morphological interpretation of the sites.

Thus the modern pedogenesis in the Valley is characterized by structure profiles, by the presence of caliche horizons, and by a slightly coarsened texture of the topsoil due, in all probability, to a partial removal of the finer materials by wind. Geochemically, the examined profiles are immature, in the sense that the sorting of salts is poorly expressed in the upper parts of the soil section, despite a noticeable penetration of the salts into the lower horizons.

Ancient Pedogenesis. The soil mantle at Tepexpan, Totolzingo Slopes, and Elephant appears to contain a record of three distinctive types of pedogenesis.

The modern type of soil profile, in the upper part of the mantle is represented by the upper two horizons as follows: (a) topsoil at 0 to 5″ and a limy layer (loamy fine sand to fine sandy loam) both found at Totolzingo Slopes — "A," (b) loamy fine sand to fine sandy loam at 0 to 20″ and caliche at 0.2″ to 30″ or 48″ both found at Totolzingo Slopes, (c) agricultural soil (brownish gray silt loam to fine sandy loam) at 0 to 13″ and a limy horizon at 13″ to 17″ both found at "Elephant Site," and (d)

topsoil at 0 to 6″ and a limy horizon (caliche) at 6″ to 16″ at Tepexpan Man Site. The combined depth of the two horizons does not exceed two feet. The profiles are entirely analogous at all four sites and, indeed, representative of the area as a whole.

Below the Recent profile, there lie some partially calcified and salinized materials unrelated genetically, either to the upper or to the lower parts of the soil mantle. These materials are said to be, geologically, lake sediments, divisible into a number of different formations. Pedologically, however, the following soils are homologous, despite certain minor textural and mineralogical dissimilarities: (1) a calcified silt-sand mixture between the caliche and the upper pebble beach found at Totolzingo Slopes — "A," (2) calcified material below the caliche at 48″ to 108″ in depth at Totolzingo Slopes, (3) *Totolzingo* (?) material (a light gray silt loam to very fine sandy loam) at 17″ to 38″ in depth at "Elephant Site," and (4) *Totolzingo* (?) material (a light gray sandy loam to fine sandy loam, nearly massive, poorly permeable, and cohesive) at 16″ to 34″ in depth found at Tepexpan Man Site.

All four are characterized by the presence of fairly numerous grass root channels, — an indication of an old substratum of some higher flora. The root channels are filled commonly by salts (chiefly lime and gypsum), locally by brown fine earth or by humus substance. The Totolzingo (?) material at 17″ to 38″ at "Elephant Site," especially, with its somewhat better developed structure, contains a more conspicuous evidence of the fine brown earth fillings not only of the root channels but of cracks between clods of soil and what appears to be worm holes. Only one apparent kretovina was observed in this horizon; although I am not entirely sure of this identification, in view of the vagueness of its outlines. The saline fillings of the grass root channels may have originated in the upper profile of the present soil mantle. The fine brown earth fillings may owe their origin to an ancient surface that had subsequently disappeared, to be replaced by materials from which the modern caliche profile has developed. The above-mentioned Totolzingo (?) material and the Totolzingo (?) material at 16″ to 34″ in depth at Tepexpan Man Site resemble a vestige of an old prairie soil. Regardless of the manner of deposition of the material in question, the field evidence alone seems to suggest that, at one time or another, this material was undergoing weathering under a subaerial growth of grass. The extent of this weathering is difficult to judge. (The clay-content of this fossil horizon is not high, although the masking effects of diffuse lime and salts need to be taken into account in all such appraisals.)

It is possible that the period of subaerial pedogenesis was preceded and followed by periods of subaqueous weathering. The former is suggested by the presence of shell fragments, most severely decalcified; the latter — by vestiges of a vesicular massive structure, not uncommon in submerged humus materials. The Elephant and the Tepexpan Sections are indeed similar in these respects. The Totolzingo Sections, while retaining vestiges of a subaerial pedogenesis in the sub-caliche horizons, show no structural evidence of the later submergence.

The upper boundary of the "prairie" horizon, as exemplified by all four sites, is distinct. Its lower boundary is less distinct and is, indeed, controversial. According to some geologists, this horizon at the Elephant Site is underlain by a different formation and the two are not related genetically (this different formation is absent or indistinct at the Tepexpan Site and is absent at the Totolzingo Sites). In my view, the color boundary between the two and the mineralogical difference (small black kernels or perhaps iron-manganese concretions in the material under the "prairie" horizon) may be geochemical expressions of the weathering gradients rather than of differences in the origin of the two materials. Locally at least, at the Elephant Site, the two materials definitely grade one into another. Their boundary is indistinct, as a rule. (The horizons at the Elephant Site are now marked off by a cord inlay, whereby their common boundary is accentuated and a regrettable illusion of a real difference is produced.) My impression is that the "sub-prairie" horizon at the Elephant Site is the parent material of the "prairie" horizon and that both constitute a fossil soil profile, a palaeosol, of considerable antiquity. The environment and the pedogenesis represented by this palaeosol is different and distinct both from the modern caliche profile above and the ancient horizons below where remains of man and elephant were discovered. The "prairie" palaeosol, could have developed in the

course of millennia of a somewhat more rainy environment than the present, perhaps under a more uniformly distributed rainfall than the present in a climate more continental than the present, with respect to the temperature gradients between the seasons.

The lower boundary of the "prairie" palaeosol is well defined. It is marked by a thin layer of pumice gravel at the Tepexpan Site and, insofar as the present submergence in water allows to judge, by a sharp mineralogical boundary at the Elephant Site. At the Totolzingo "A" Site the boundary is a fossil beach. At the Totolzingo Slopes Site the boundary is marked by basalt cobbles and gravel.

Below the "prairie" palaeosol, at the Elephant Site, there is a thick layer of fine volcanic ash weathered into a bentonite-like material. The analogous layer at the Tepexpan Site is a sand-clay mixture, with the great preponderance of sand, containing pockets of finer-textured materials resembling the Elephant Site weathered ash and lenses of coarse gray sand, probably of volcanic origin. Both are the Becerra Formation. It is in this formation that both man and elephant were found.

Thus the soil mantle at the sites examined contains three soil profiles, in the broad sense of the term:

(1) The most ancient one, with the remains of man and animal, representing a cold pluvial environment and the high stands of water in the lakes, representing perhaps one of the Wisconsin maxima of the glaciation.

(2) The transitional "prairie," representing a greatly diminished rainfall (but still in excess of the present one), a relatively more continental climate, and a lower stand of the lakes.

(3) The modern caliche profile representing essentially the present environment.

Our guess as to the time represented by the soil mantle is that at least $nx10^4$ years would be required to account for the observed maturity of the profiles.

If the type and the extent of the weathering of the basalt at Totolzingo Slopes is taken as the criterion of the time interval between the Becerra and the "prairie," the bulk of the time here proposed should be assigned to this interval. My feeling is that the corresponding magnitude is well in excess of 10,000 years, and that the age of the entire polymorphic mantle is in excess of 20,000 years. If so, the Tepexpan Man lived and hunted elephants with stone weapons of considerable refinement well within the Wisconsin glaciation.

The above generalization is subject to revision and change, depending on further study and analysis. There are certain difficult features about the hydrology of the Valley remaining to be understood and the geochemical background of the present study is insufficient. Moreover, I failed to observe any evidence of the post-glacial dry periods, the post-glacial warm periods, the post-glacial low and high sea stands (and their inland analogues), etc., not only in the Valley of Mexico but in Lake Bonneville Basin, Australia, the U. S. Atlantic Coast, California, and elsewhere, — an embarrassing failure either of observation or of analysis or both. Instead, I picture the post-Wisconsin climatic successions, seen in the weathering record, as a fairly well sustained climatic transition equivalent to several hundred miles' latitudinal swing in the climatic boundaries, with major distortions due to the topographic control, with corresponding altitudinal shifts, as in the Valley of Mexico or the Bonneville Basin, with local and temporal delays and minor reversals, even as seems to be the case with the majority of complex phenomena caused by reactions between and within the outer geospheres.

In summary we can say that a pedologic-geochemical study of some archaeological sites in the Valley of Mexico indicates a relatively gradual climatic change, from time of the Wisconsin glaciation to the present, from a cold pluvial environment, through the moderately pluvial continental, to the present seasonally arid. There is no evidence of any major departure from this sequence or of any catastrophic change or reversal in the trend of the post-Wisconsin environment that could not be accounted-for in terms of the common and normal pedogenetic-pedoctonic fluctuations.

The oldest known remains of man and elephant in the Valley belong to the cold pluvial environment characteristic of the glaciation maxima. These remains may be dated as $nx10^4$ years before the present, by the pedologic-geochemical evidence, without the aid of other methods.

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CULTURAL VARIATION WITHIN TWO WOODLAND MOUND GROUPS OF NORTHEASTERN IOWA

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ALTHOUGH MANY large mound groups, are found in northeastern Iowa, little information concerning the prehistory of this region has been published. Results of limited early investigations, presented by Cyrus Thomas in the 12th Annual Report of the Bureau of American Ethnology, are indicative of a fertile field. Records of the pre-1900 Hill-Lewis survey, preserved in the files of the Minnesota Historical Society, include descriptive notes and maps locating many Iowa mounds which have since been destroyed. Field reports by the late Ellison Orr, assistant supervisor of a statewide archaeological survey, made in the 1930's by the Iowa State Historical Society, may be found in the collections of the Society at Iowa City. Articles by the late Charles R. Keyes (1934, 1951), field supervisor of this latter project, describe the wealth of the state's prehistoric resources. Nevertheless, the data concerning the contents of the mounds in northeastern Iowa is meager.

A few mounds can be distinguished as Hopewellian because of diagnostic grave goods. Distinctive mounds of the effigy and linear forms similarly indicate the extension of the Effigy Mound aspect into the region. This is a complex better known from its center of concentration in Wisconsin (McKern, 1930). Northeastern Iowa is clearly marginal to the primary growth of both cultures, and it is not evident that a "pure" complex of either has been strongly developed in the area. Coupled with this indication of a marginal distribution is another geographic factor. The available data are derived mainly from sites along the Mississippi River and the lower reaches of its tributaries. As a major artery of prehistoric communication, the Mississippi would facilitate the blending and diffusion of cultures. A wider variety of cultural manifestations could be expected alongside this important waterway than in hinterland areas.

It is evident that the primary need in an archaeological program for the region is a thorough description of the contents of the mounds and an analysis of the artifacts and other cultural traits designed to determine the various groups present and to reveal their development through time. At present the lack of adequate samples of classified data obtained from controlled excavations makes it extremely difficult to interpret local archaeological materials. It is true that various manifestations have been described in adjacent states, with which comparisons can and should be made. These studies in Wisconsin, Illinois, and Minnesota, however, do not lessen the need for research in Iowa which will enable investigators to determine what local variants have emerged. Northeastern Iowa, and the state as a whole, may be of increasing importance in establishing a link between the prehistoric cultures of the Missouri River and the northern Mississippi Valley.

During two seasons, 1950 and 1952, the writer had an opportunity to conduct excavations along the Mississippi River in the recently established Effigy Mounds National Monument and in the Sny-Magill Mound group. Marked variation in the cultural remains was manifest within adjacent mounds of each group investigated. This confirms the view that a reconstruction of the prehistory of this region will reveal complex relationships. The objective of this paper is to present the results of the recent investigations and to suggest an interpretation of the cultural differences exhibited.

SNY-MAGILL MOUND GROUP

The Sny-Magill group is located on a heavily wooded flood plain remnant six miles south of McGregor, Iowa, and one-half mile north of the junction of Sny-Magill Creek with the sloughs of the Mississippi. The land surface slopes gently westward toward an old channel at the base of a high bluff on the right bank of the river. During seasonal floods all of the tract is inundated except for a few acres along the eastern portion which border on Johnsons Slough, a channel separating it from numerous neighboring islands. This elongated area, above the highest waters of recent years, is largely covered by a group of 96 mounds — 5 effigies, 6 linears, and 85 conicals (Fig. 19). Were it not for a survey made by T. H. Lewis in 1885, it now would be impossible to locate four or five of this group because of gardening on the site in the early decades of the 20th century. Other mounds have been damaged by various

construction activities and by the unrestrained digging of relic hunters. However, in the spring of 1952 approximately 40 of the mounds appeared to be relatively undisturbed. Four of these were selected for excavation. Those chosen were mound 43, the largest conical; mound 27, one of two bird effigies; mound 81, a conical representing the smallest size; and mound 24, a conical mound of intermediate size between mounds 81 and 43. Excavations revealed that mound 81 had been vandalized; therefore, another low domed conical, 7, was selected for investigation. Test trenching for habitation sites associated with the mounds was unrewarding.

Mound 43 was a symmetrical conical with a maximum central height of five feet. It was impossible to determine the exact limits of the perimeter, but, our best estimate of the margin, showed the mound to measure 67.5 feet east to west and 70.7 feet north to south. Under the mound, 6.5 feet below a datum plane established at the highest point, was a compact gravel bed. The pre-mound soil profile above the gravel consisted of .3 foot of dark humus soil which rested on 1.2 feet of yellow subsoil. Preceding the construction of the mound a flat bottomed depression .6 foot in depth had been excavated over an elliptical area 16 feet north to south by 13.3 feet east to west.

A layer of red ocher had been applied to the floor of this depression (Fig. 20) coloring the earth to a depth of .1 foot. A sidescraper imbedded in this red deposit was the only artifact recovered from the lower portion of the mound. Particles of charcoal were noted near the floor margin and on the old humus layer immediately surrounding the prepared surface. The floor of another depression 1.6 feet above the red stained floor could be identified by a thin dark soil line in the vertical profiles. Within this upper depression occurred most of the mound's intentional inclusions associated with additional layers of red ocher. The fill above the upper red strata produced a hammerstone, chert flakes, pottery fragments and charcoal, which indicated that the earth for the mound had been collected from an occupation site. Charcoal samples were collected for dating.

Four groups of bones in the northwest quadrant of the mound were identified as secondary burials. They were in such an advanced stage of decomposition that little more than the teeth could be salvaged. Burial 1, located on a level 3.3 feet below datum and 3.2 feet northwest of the mound center, was a concentration of skeletal material of three individuals. The bones of two of these were disarticulated when buried. The remains of the third, however, had been deposited while many of the bones were held in their anatomical order by the ligaments.

Burial 2, 3.7 feet below datum and only a few inches west of burial 1, was a bundle burial with no observed instances of articulation. Burial 3, a few inches west of burial 2 and 3.8 feet below datum, was in a somewhat better condition than the others. It was apparent that the skeleton had been folded into a bundle while the ligaments still united many of the bones. Burial 4, one foot southwest of burial 1 and 3.6 feet below datum, consisted of only four badly decayed long bones in close parallel order, but the texture and color of the surrounding soil suggested that additional bones

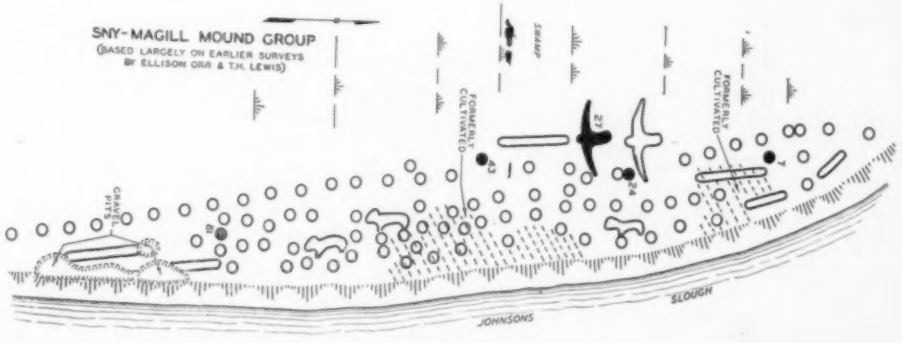

FIG. 19.

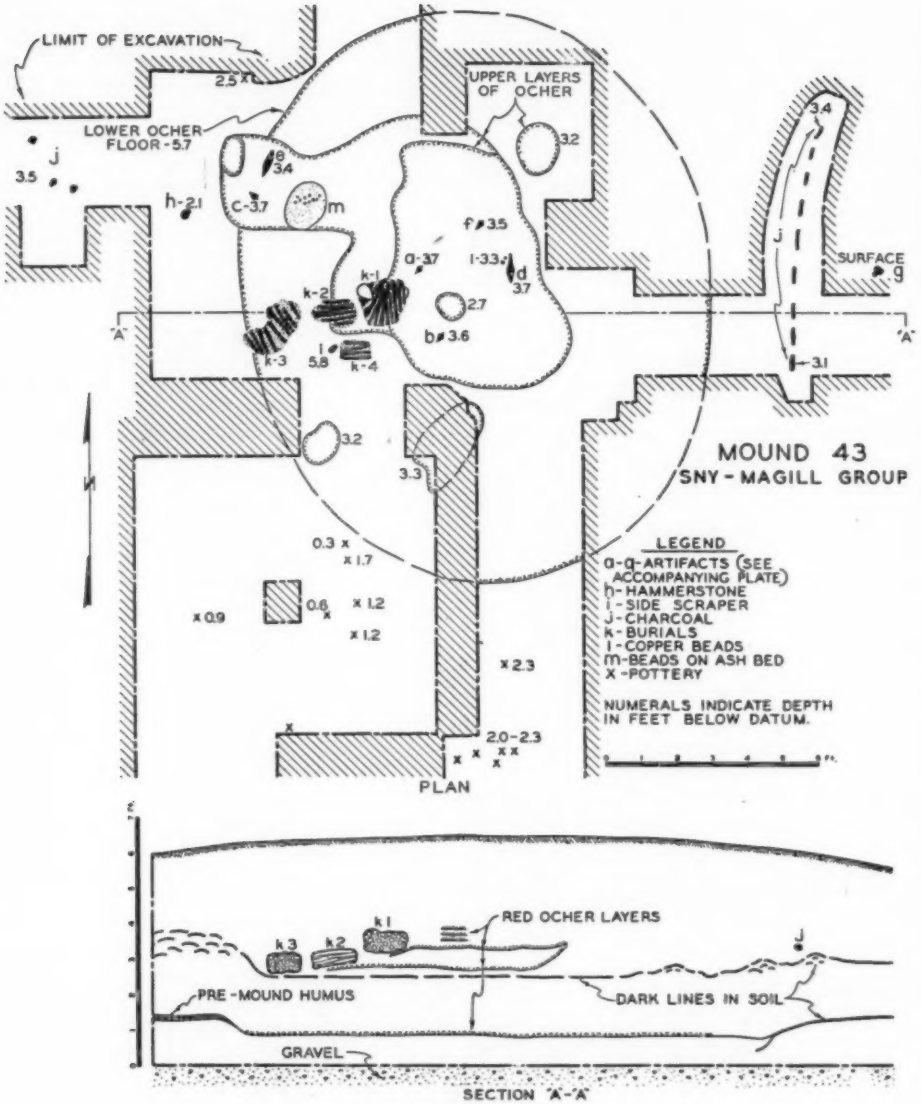
LIMIT OF EXCAVATION
2.5
LOWER OCHER FLOOR - 5.7
UPPER LAYERS OF OCHER
3.2
3.4
j
3.5
e 3.4
h-2.1
c-3.7
m
f 3.5
a-3.7
i-3.3
d 3.7
SURFACE
g
k-2
k-1
2.7
b 3.6
"A"
"A"
k-3
l 5.8
k-4
3.1
3.2
3.3
MOUND 43
SNY - MAGILL GROUP
0.3 x
x 1.7
LEGEND
a-g-ARTIFACTS (SEE ACCOMPANYING PLATE)
h-HAMMERSTONE
i-SIDE SCRAPER
j-CHARCOAL
k-BURIALS
l-COPPER BEADS
m-BEADS ON ASH BED
x-POTTERY
NUMERALS INDICATE DEPTH IN FEET BELOW DATUM.
0.6
x 1.2
x 0.9
x 1.2
x 2.3
2.0-2.3
PLAN
RED OCHER LAYERS
k 3
k 2
k 1
j
PRE-MOUND HUMUS
DARK LINES IN SOIL
GRAVEL
SECTION "A-A"

FIG. 20.

had once been present. Burials 3 and 4 lay beyond the limits of the red ocher layers upon which burials 1 and 2 rested.

These red strata, not as extensive as the lower prepared floor, were irregular in outline. In general, they ranged from .05 to .1 foot in thickness, but in a few places of greater concentration a maximum depth of .5 foot was reached. The ocher had been spread over an uneven surface so that a variation in the measurements from the datum plane to the artifacts imbedded in the strata ranged from 3.4 to 3.7 feet. Most of the chipped stone artifacts were associated with the upper layers of red ocher, but at some distance from the burials.

Approximately 3.5 feet northwest of burial 1 and less than .1 foot below the layer of red earth was a circular deposit of a white substance believed to have been wood ash. It measured 1.5 feet in diameter and .4 foot deep at the center. In the thin layer of dark earth between the ash bed and the red layer 10 copper beads were recovered. They had been reduced to copper salts, and little, if any, of the metal remained. The beads were short and relatively thick, the lengths varying from 3 to 6 mm. and the outside diameters from 4 to 6 mm. Within the red layer and a few inches northwest of the ash deposit lay a straight stemmed projectile point (Fig. 21, *c*) and a large lanceolate blade (Fig. 21, *e*). The point was of chert, 6.1 cm. in length, 3 cm. in width at the shoulders, and 1 cm. in maximum thickness. The blade of pinkish chert with red inclusions was 18.3 cm. in length and 4.5 cm. in maximum width. The maximum thickness of 1.1 cm. was near the blunt end. On both faces a small amount of an unidentified black substance adhered to the surface.

Three projectile points, another lanceolate blade, and the remains of two copper beads were recovered to the east of the burials. All were imbedded in extensive red earth strata except the large blade, which rested immediately upon a stratum at a distance of 3 feet from burial 1. The two beads rescued as flakes of copper salts appeared to be identical with the other beads from the mound. They were uncovered a few inches northwest of the large blade and in a red stratum four inches higher in the fill. The lanceolate blade (Fig. 21, *d*) measured 21.7 cm. in length and 5.1 cm. in width while the maximum thickness of 1.1 cm. was recorded at the stem end. The maximum thickness of the blade above the stem was .8 cm. It was fashioned from the same variety of chert as the other lanceolate blade taken from the mound. A straight stemmed projectile point of chert (Fig. 21, *f*), found 1.3 feet northwest of the large blade, measured 9.2 cm. for length, 2.3 cm. for width, and .6 cm. for thickness. One stemmed point of quartzite (Fig. 21, *b*), found 1.2 feet southeast of burial 1, was 2.4 cm. in width and .86 cm. in thickness, with the former length estimated to have been 5.4 cm. A small flint point (Fig. 21, *a*) measured 2.3 by 3.6 by .7 cm.

The sidescraper, a thin quartzite flake with some evidence of retouching along the convex edge, measured 6.6 cm. long, 3.6 cm. wide, and .8 cm. thick. The base of a large stemmed point (Fig. 21, *g*), from the grass roots some 17.3 feet east of burial 1, was 4.7 cm. wide at the shoulders, with a maximum thickness of 1.4 cm. The relatively short, rounded stem was 2.7 cm. wide.

Twenty-six sherds were recovered from the mound, all within 2.4 feet of the surface. Twenty-five were probably from the same vessel. The remaining sherd, darker in color and with a heavy cord-wrapped-paddle decoration, was firmer in texture, and contained granitic temper.

Despite their crumbly nature, some of the sherds in the lot of 25 could be assembled to indicate that the vessel form was a relatively large jar which contracted from the shoulder at about a 45 degree angle to a vertical or slightly flaring rim (Fig. 22, *a-d*). The surface of the vessel had been smoothed before receiving a series of vertical rocker impressions on the shoulder and body region. A variation in the intervals between the teeth at the center of the rocker stamp produced a smooth horizontal band across the series of imprints. The rim had been thinned at the rounded lip. Between the lip and a band of horizontal twisted-cord imprints encircling the neck was a narrow horizontal band of slightly diagonal string impressions. Below the encircling string impressions was a decoration of twisted cord imprints arranged to form a series of contiguous chevrons. The paste of this jar was yellowish-brown with a similar interior and exterior surface color. It contained a fine grit temper, of which little may be noted on the surface.

The encircling band of cord-impressed decoration near the rim indicates a close relation-

ship with one of the Effigy Mound pottery types included in "Lake Michigan" ware, which Baerreis (n.d.) has recently designated as *Madison Cord Imprinted*. In northeast Iowa the use of a rocker dentate stamp is regarded as a Hopewellian trait, so the combination of rouletted decoration and the encircling string impressions suggests a blending of cultural influences. In any event the occurrence of these sherds in the fill indicates that the mound was completed after both Hopewellian and Effigy Mound influences had appeared in the region.

Mound 43, which contained extensive layers of red ocher below or to one side of the burials, seems not to have a parallel in published literature. Manuscript reports by the late Ellison Orr record that somewhat similar contents were found in a few mounds excavated in northeastern Iowa. Two mounds at Harpers Ferry, Iowa, included small areas of red earth. A third contained a red stained floor over a large area not fully excavated. A red ocher floor 30 feet in diameter was uncovered in a fourth mound. Associated with these red layers were secondary burials accompanied by a long copper bar, 125 globular beads of copper, Woodland projectile points, and one finely flaked lanceolate blade approximately 28 cm. long. Similar blades and beads stained with red ocher found in Wisconsin by non-professional collectors have been donated to the Milwaukee Public Museum (Brown, 1940).

The occurrence of at least some red ocher has been reported from so many Woodland complexes in adjacent states — Hopewell (Titterington, 1952; Cooper, 1933), Effigy Mound (Brown, 1940), Red Ocher (Cole and Deuell, 1937), Clam River (Martin, Quimby, and Collier, 1947) — that the presence of some in a mound cannot be considered sufficiently diagnostic to identify a culture or a time period. Mound 43 is regarded as a Woodland manifestation, however, because of the examples of the typical chipped stone industry it contained and the fact that red ocher does not constitute an unexpected find in a burial mound of the Woodland pattern.

Mound 27, a bird effigy, was selected for testing because so little is known of this type in Iowa. While as many as 67 bird effigies were reported from the mound group at Harpers Ferry, Iowa (Keyes, 1928), it is now believed that there are no more than a dozen remaining in the state.

The outstretched wings of this mound measured 158 feet from wing tip to wing tip. A rounded head projected forward from the shoulders for 13 feet, and the over-all length of the body was 78.6 feet. The width of the body midway between the wings and the tail measured 24 feet. The maximum height of the mound, at the intersection of the axes of the body and the wings, was 2 feet above the surrounding terrain. An exploratory trench, varying from three to four feet in depth, was opened along the central portion of the body from a test pit beyond the head to a point 36 feet from the tail. This trench was five feet wide along most of its length, but the width was expanded to 8.5 feet for a distance of 15 feet in that portion of the body between the wings.

Within the wider section of the trench lay a small circular area of yellow subsoil, 5 feet in diameter, on a level .4 foot higher than the remainder of the subsoil exposed nearby and 1.8 feet below the mound top. Near the center of this area and directly upon it the enamel

FIG. 21. Artifacts from mound 43, Sny-Magill group.

portions of 12 teeth, from a nine year old child, were recovered from an open rodent burrow. A human metatarsus found near the west margin of this platform of yellow subsoil, was adult in size and fairly well preserved. Its presence suggested that the complete excavation of the mound would reveal an adult burial.

Mound 27, a bird effigy, from its shape alone must be identified with the Effigy Mound aspect. McKern (1930, p. 459) has indicated that it was not uncommon to uncover a minimum of skeletal material unaccompanied by grave goods in the effigy mounds of Wisconsin.

Mound 24 was of the conical type, 37 feet in diameter and three feet in height above the level of the present surface between it and adjacent ones. It overlapped a vandalized conical of similar size to the south by 1.5 feet while the northern margin was 6.9 feet from the wing of a bird effigy. At the beginning of the excavation a test pit was dug beyond the west edge, into the compact gravel bed underlying the surface soils, to reveal soil strata. From this pit a trench was extended into the central portion of the mound, where a rectangular area approximately 13 by 9.5 feet was removed.

It is believed that the dark colored fill had been collected initially from the nearby top soil. At a depth of 2.6 feet below a datum plane established at the summit of the mound, it was possible to detect a dark soil layer which apparently represented the original humus zone. Thus 6 inches of the mound's height could be attributed to the lowering of the surrounding surface when some of the adjacent mounds were constructed. Upon the premound surface, 1.2 feet west of the mound center, rested a portion of a skull cap already separated into many fragments when exposed. In the fill above the calva a number of potsherds were recovered. The larger sherds were on a level 1.8 feet below datum, while smaller ones which may have been moved by rodents ranged in depth from .9 to 2.3 feet below datum. All of the larger sherds were lying horizontally with their exterior surfaces facing downward; hence, it appears that they had been purposely included. A few chips and flakes of chert and a number of charcoal fragments completed the inventory of inclusions. The charred material came from close to the surface, but was saved with the hope that a valid radiocarbon date could be obtained.

The sherds, from two quite similar vessels, were found at 16 points within the mound. Sometimes they appeared singly, but more frequently as numerous pieces of one large segment of a jar. A few of them indicated the

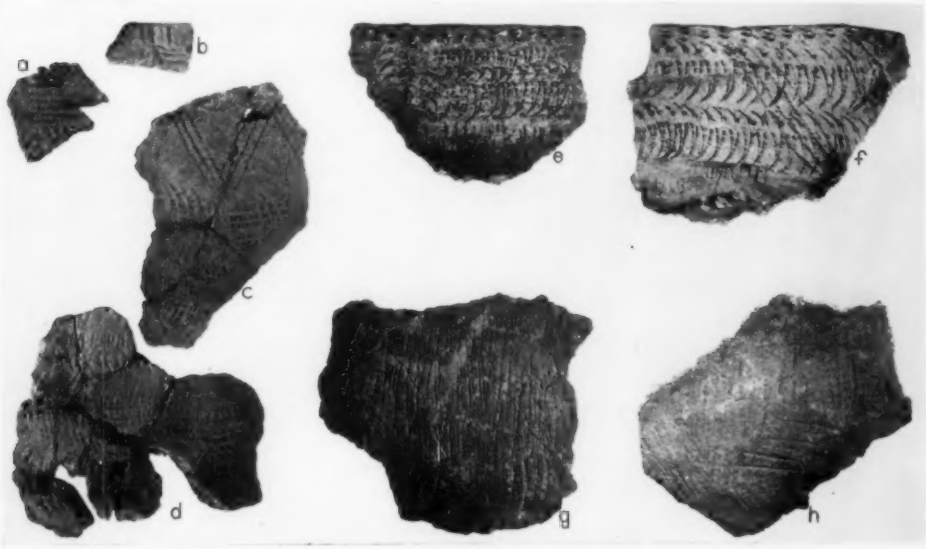

FIG. 22. Sherds from Sny-Magill group. *a-d*, mound 43; *e-h*, mound 24.

vessel form and decoration, but for the most part the soft, crumbly texture made restoration impossible. It even made the simple preservation of many individual sherds a difficult problem. Apparently low and uneven firing had produced a variation in their quality. The paste was a yellowish-brown, containing abundant granitic tempering material ranging from 1 to 4 mm. in size. This tempering material is apparent on both the interior and exterior surfaces. The body sherds ranged from .7 to 1.1 cm. in thickness while some rim sherds did not exceed .6 cm.

The exterior surfaces of the body sherds were largely covered by cord impressions made with a cord-wrapped-paddle. Here and there some of the decoration had been almost obliterated by smoothing. On one vessel the cord imprints were vertical. On the other the majority of them were vertical, but frequently these were overlaid by others tending to be horizontal (Fig. 22, *e-h*). Two large rim sherds were quite similar. Both were from jars with rims that had been smoothed and then encircled by two horizontal rows of toothed vertical rocker imprints combined with vertical cord-wrapped stick imprints placed immediately below the lip. A tooth was missing in the rocker, thus a smooth horizontal band remained across the rocker impressions.

FIG. 23. Hopewellian artifacts from Effigy Mounds National Monument. *a-c*, mound 55; *d*, mound 57.

In addition to the decoration mentioned, one rim sherd had two sets of four parallel, diagonal cord imprints across the two horizontal bands of rocker impressions. The other had a vertical series of horizontal rocker imprints. The zone of decoration on the outer rim of the larger sherd varied from 6 to 6.5 cm. in height while that of the smaller one measured 4.2 cm.

The indicated vessel form was a jar which gradually contracted from the shoulder area at an angle of about 45 degrees to a vertical rim. The curvature of one rim sherd suggested an orifice approximating 9 inches in diameter.

The presence of sherds bearing rocker dentate decoration implied a Hopewellian origin for mound 24.

Mound 7 was a low conical, 25.5 feet in diameter and only 1.4 feet in height. Upon excavation no evidence of internal construction features could be detected for apparently the mound fill of humus-laden soil had been gathered nearby. The inclusions consisted of skeletal material from two individuals, and three triangular arrowpoints. The burials were resting on a level 3 inches lower than the surface surrounding the mound, suggesting that the sod had been removed before the interments were made.

Burial 1, a compact bundle burial, centered .5 foot west of the midpoint of the mound. Most of the bones were present and articulated. They included the column of vertebrae with some sections of ribs present in anatomical union. However, the distal end of both humeri with the proximal ends of the ulnae and one radius were separated by the full length of the burial from the proximal end of the femura which were articulated with the pelvis. The skull rested in an upright position with the mandible tightly wedged between it and the mass of bones. The displacement and reorientation of these bones indicated that this had not been a burial in the flesh but rather a secondary inhumation made while many ligaments were still present.

South of burial 1 were some of the dispersed bones of another individual. The shafts of five

long bones in close parallel association, 2.9 feet from burial 1, may represent the location of the original burial, from which the remainder of the bone fragments had been moved by woodchucks or other rodents.

The scattered bones between the two groups *in situ* were in a defective condition, but it was possible to identify a few skull fragments and portions of a mandible. Some of the teeth recovered near the mandible had been subject to sufficient wear to expose pulp cavities while one contained a distinct caries pocket. Since it was impossible to determine the extent of rodent disturbance within the mound, it seems pointless to make a conjecture as to the nature of the original interment.

Three small triangular arrowpoints of chert were recovered on the same level as the skeletal material and within the area of the disturbed or dismembered burial. One point with slightly convex sides and a thin concave base was 2.2 cm. long, 1.5 cm. wide, and .45 cm. in maximum thickness. A second point, 2.8 cm. in length, 1.45 cm. in width, and .4 cm. thick, had straight edges while the base bore an ovoid flake scar between worked shoulders. It appeared that a stem had been broken away at the junction with the blade, but it is problematical whether the break had occurred by accident or from an intentional blow struck to modify a stemmed point. The third point, possessing a thin base, was only a unifaced flake with a minimum of retouching. One of the diagonal sides was straight while the other was slightly convex. The measurements for this point were 2.86 by 1.5 by .4 cm.

A list of the observed traits in mound 7 is quite short. It was a conical mound with the top soil probably removed, containing two secondary burials and three small unnotched arrowheads. Only the presence of the points is greatly significant.

In a recent study of the archaeology of the region in the vicinity of Madison, Wisconsin, Baerreis (n.d.) has proposed a division of the local Effigy Mound aspect into three time periods. The most recent one is characterized by the presence of small triangular projectile points comparable to Mississippian points. These appear to be in association with a thin Woodland pottery type designated *Madison Cord Imprinted* as well as a corresponding type possessing a collared rim. A somewhat similar association may be seen in Nickerson's Village 2 in Jo Daviess County, Illinois, described by Bennett (1945, p. 75). At this village diminutive, unnotched, triangular projectile points are evidently in association with a "Lake Michigan" pottery type. From the illustration it appears that this particular variety is similar to *Madison Cord Imprinted*. Although the triangular projectile points in mound 7 might be interpreted as suggesting an Upper Mississippi mound, or at least Mississippian influence, evidence has accumulated to indicate the presence of triangular projectile points in late Woodland contexts.

Effigy Mounds National Monument

Effigy Mounds National Monument, with a gross acreage of 1,204.39 acres, is located along the west bank of the Mississippi some 10 miles north of the Sny-Magill group. The Monument is divided into north and south units by the Yellow River. Recent surveys disclosed the presence of 62 mounds on the north portion — 45 conical, 10 linear, 4 effigy, and 3 mounds having conicals connected by linear embankments. At least 55 others (Orr, n.d.) have been destroyed in recent decades and many of the remaining ones have been vandalized. Of those surviving, 54 are on the bluff tops overlooking the Mississippi River. The other 8 are on bottomland at the mouth of the Yellow River, some 300 feet lower. Following the establishment of the Monument in 1949, seven representative mounds were investigated and one pottery bearing site examined in a railroad cut. The results of these investigations are given in the following paragraphs.

Mound 19, linear in form, lay in a formerly cultivated field some 350 feet above the Mississippi. Because of continued farming operations in the past it was possible to detect only a small portion of this mound from an inspection of the surface. Three neighboring effigy mounds, recorded fifty years ago, had been entirely obliterated. It was hoped that the margin of this mound could be accurately determined from sub-surface evidence, and that it would be possible to ascertain the exact limits of the effigies which had disappeared in recent years.

A distinct plow-line was apparent in the soil surrounding the mound, although it was obscure or absent on the site of the mound itself. This distinction was sharp enough to define the linear mound, but not enough to permit the mapping of the formerly existing effigies.

A trench 77 feet in length along the central axis, two narrow cross trenches, and three test pits at the margin were excavated without encountering an artifact, bone, or burial pit. A few fragments of charcoal were present but not in sufficient quantity to provide a sample for radiocarbon analysis. The charred material appeared to be on the pre-mound surface as nearly as this level could be determined from the surrounding terrain.

Mound 30, an undisturbed bear effigy, was next investigated, but again no artifact or recognized evidence of a burial was uncovered. A layer of scattered nondescript rocks was found in the "flank" region, apparently on the old ground level. The rocks were partly imbedded in a rather loose soil which contained granules of charcoal. This layer of rocks may have been an "altar" as described from similar effigy mound groups in Wisconsin (McKern, 1930).

Two inches above the level of the stone layer and between 4 and 5 feet toward the head of the mound from the altar, small pieces of charcoal were collected for radiocarbon dating. From this material H. R. Crane, University of Michigan Memorial Phoenix Project Radiocarbon Laboratory, established a date of 930 years ago, plus or minus 300 years.

Mounds 48 and 49 were two of the six remaining unvandalized mounds in a string of 19 conicals on the bluff which overlooks both the Mississippi and Yellow rivers. Most of the looting took place late in the nineteenth century. Local residents reported seeing some sherds and bone fragments around the pits in recent years. Hints of past finds within the group were encouraging when the exploration of mounds 48 and 49 began, but both were barren of artifacts and significant features.

Apparently constructed from the surrounding soil, no evidence of the former ground level or a burial pit could be discerned in either. The shades of soil color blended so gradually from the dark surface top soil to the yellowish undisturbed subsoil that no trace of a demarcation line could be detected at any level. If the mounds once contained burials, their absence now could be explained by deterioration in an acid soil. Probably the sod had been removed from the area prior to the mound construction.

With so little evidence available, it does not appear practical to attempt to identify the builders.

Early reports indicate that a group of 58 mounds — 37 conicals, 12 linears, 6 club-shaped embankments, and 3 bear effigies — once existed in the valley of the Yellow River near its junction with the Mississippi. All have been destroyed by cultivation, vandalism, or construction activities save two linears and six conicals. Three of the conicals — mounds 55, 56, and 57 — which formed a small compact group on a talus slope beside a formerly cultivated field, have recently been investigated. Excavation disclosed that mound 56 had been looted long ago by relic hunters. Mound 55 yielded evidence of partial cremations, bear canine ornaments, and large flint blades of the Hopewellian type (Fig. 23). A sample of charcoal was obtained from which Crane procured a date of 900 years before the present, plus or minus 300 years. Mound 57 contained a rectanguloid sub-floor burial pit under a layer of limestone boulders, evidence of secondary burials, and a copper breastplate. (Fig. 23, *d*).

A detailed report on the excavation of mounds 55 and 57 has been published (Beaubien, 1953). From the conclusion, this passage is quoted: "The traits recovered from the two mounds could be placed with almost equal facility in the three Hopewellian foci proposed for this region — the Trempealeau (McKern, 1931; McKern and Ritzenthaler, 1946) and the Red Cedar River (Cooper, 1933), both of Wisconsin, and the Nickerson (Bennett, 1945) focus of northwestern Illinois and eastern Iowa. Of the specific traits which have been listed for these foci and are shared by the Hopewellian mounds at Effigy Mounds National Monument, only the practice of cremation is specifically excluded from the Trempealeau focus, and it is shared by the other two foci."

Hanging Rock Site

Some human bones and pottery fragments were discovered in a railroad cut at the foot of Hanging Rock, a landmark on the Mississippi River 1¼ miles north of the Yellow River. It was evident that prehistoric peoples of Woodland antecedents had interred their dead at the foot of the cliff. Following the excavation of the roadbed through the talus slope, patches of soil containing archaeological remains were left clinging to the natural rock on the west side of the cut. With the passing of time the remains slumped downward. Material reaching the

right-of-way presumably had been removed from time to time by track men. A limited amount of material from which archaeological specimens were salvaged appeared to have been protected for a time in the shallow crevices of the cliff before dropping to a lower level.

Of particular interest were a few significant sherds among the 120 that were collected. An Early Woodland culture was suggested by one bearing incised-over-cord-roughened decoration typologically similar to *Black Sand Incised*. Middle Woodland was represented by one rim sherd with a horizontal band of vertical dentate stamping, resembling *Havana Zone Stamped*, and by a rouletted body sherd indicating Hopewellian influence. Several rim sherds of *Madison Cord Imprinted*, Late Woodland, also were present.

CONCLUSION

The radiocarbon dates, 900 B.P. for mound 55 and from 1,955 to 2,336 B.P. for Hopewell centers in Illinois and Ohio (Johnson, 1951), allow an extremely long period during which the groups of mounds along the Mississippi could have been constructed. The range of pottery types from the Hanging Rock site, Effigy Mounds National Monument, also, suggests the presence of components widely separated in time. Manifestly, insufficient data have been derived from controlled excavations to establish satisfactory developmental sequences within this time span.

Relatively little information concerning cultural blending was uncovered. A combination of Effigy Mound and Hopewellian decorative techniques was noted on a few sherds and the associated burial mounds were intermixed. The very size of some mound groups indicates that they were constructed over a long period of time, and the possibility of diverse peoples using the same burial plots through a considerable span of years cannot be overlooked. Nevertheless, the similarity of radiocarbon dates obtained from Effigy mound 30 and Hopewellian conical mound 55 could indicate that the two groups were occupying the same territory concurrently. On the other hand, this might suggest that a fusion of these cultures was already in progress. The plus or minus factor of 300 years, however, permits a time period sufficiently long for the construction of one mound to have preceded the other by centuries.

For the most part, descriptive accounts and interpretations have tended to regard each group of mounds as representing a basic cultural unit. It appears that the dynamic aspects of the region's cultural history would be obscured rather than clarified if this approach is employed in analyzing materials from these sites beside the Mississippi in northeastern Iowa. At both the Sny-Magill area and Effigy Mounds National Monument, mounds in close proximity yielded dissimilar remains which, in their entirety, reflect a long transitional period between predominantly Hopewellian and predominantly Late Woodland cultures.

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National Park Service
Omaha, Nebraska
February, 1953

PAUL DAVID REITER — 1909-1953

PAUL DAVID REITER, born in Pittsburgh, Pennsylvania, May 11, 1909, died in Ann Arbor, Michigan, January 10, 1953. This span of years was largely devoted to anthropology, and the related fields of geology and biology. Not all of the work was of a professional nature, but served as an excellent background for later studies.

In 1925 Paul began working part-time as a driver for the late Dr. E. L. Hewett, a job which brought him in contact with anthropologists working and visiting in the Southwest. After a year at Park College, Missouri, Paul transferred to the University of New Mexico where he earned B.A. and M.A. degrees. Shortly after graduation in 1931, he married Winifred Stamm. From 1931 until 1938 he served as Curator of Archaeology at the Museum of New Mexico; he then transferred to a position as Instructor at the University of New Mexico, eventually becoming Associate Professor in the Department of Anthropology. In 1939 he was awarded a General Education Board Fellowship at the University of California, and in 1943 a Thaw Fellow, Peabody Museum, Harvard University. At Harvard he was granted a Ph.D. in Anthropology in 1946. While at this university he also served as a Research Associate, Massachusetts Institute of Technology, being attached to the Chemical Warfare Service Development Laboratory. This work involved the application of physical anthropology to design of war materials such as gas masks, back packs, and carriers. He was particularly proud of a flame-thrower carrier which he had designed.

Paul was probably best known for the summer field sessions which he directed for the University, especially those at the Research Station in Chaco Canon. His earlier anthropological interests were divided between physical anthropology and kivas; his Doctor's thesis "Form and Function in Some Pre-historic Ceremonial Structures of the Southwest" reflecting the latter. As a physical anthropologist, he was often called on by the local and State Police Departments to give testimony and identification involving skeletal remains. The first item in his bibliography, "Report on San Geronimo Cave," pointed toward his major field interest during the last few years. Paul enjoyed cave work, and was an avid searcher for those that might contain remains of Early Man. Paul was an excellent photographer, both in the field and as a dark-room technician. In all his endeavors, work was his hobby.

At the time of his death, Paul was on leave of absence for special studies in human anatomy at the University of Michigan and Chicago under a Ford Foundation Fellowship.

Paul Reiter was a person of strong likes and dislikes; there was no middle ground. To me, he was a sincere, generous friend who would do anything possible to advise and assist, regardless of the time involved. The field of Southwestern anthropology has lost a stimulating teacher and researcher; one who had, and would have in the future, contributed much to our knowledge of anthropology. Personally, I have lost a good friend and colleague who worked with me throughout twenty-five years of Southwestern experiences.

He is survived by his wife, Winifred, a daughter, Ann Ellen, and a son, Gordon, who reside in Albuquerque.

STANLEY STUBBS.

(Continued on next page)

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OLIVER GARRISON RICKETSON, JR. — 1894-1952

OLIVER RICKETSON was born on September 19, 1894, in Pittsburgh, Pa., and died at Bar Harbor, Maine, on October 17, 1952. His parents were Oliver Garrison Ricketson, Senior, and Margaret Carnegie.

At the age of five, Oliver was taken to Cumberland Island, Ga., which is still owned by the heirs of his great uncle, Andrew Carnegie. Here he spent most of the next eight years in an isolated world of forests, wild animals, cattle, horses, and colored field hands — an admirable background for his future work in the jungles of Central America.

In 1907, Ricketson entered Middlesex School, where he became captain of the football team, graduating in 1912. At Harvard, he developed an interest in anthropology and was one of the first four students to take Professor Hooton's course in physical anthropology but, after graduating in 1916, he entered the Harvard Medical School.

Upon the declaration of war in April, 1917, Ricketson immediately enlisted in the navy as machinist mate. He served on the patrol ship *Scoter* which saw no action. After the war, he returned to the Medical School and completed the first year's work, but then decided that he did not want to be a doctor. Yet his medical training later proved most useful in Central America where he was called on to deliver babies and set broken bones.

In 1920, Ricketson went west to live with the Wetheralls who then ran trading posts at Flagstaff and Kayenta. With them he cruised the Navajo reservation and was on the second expedition to reach the Rainbow Natural Bridge. Later he worked with Samuel Guernsey for the Peabody Museum, Harvard University, at Marsh Pass, Arizona, and with the Cartier expedition from the American Museum of Natural History in Arizona and Utah.

During this period, Ricketson met the late Dr. Sylvanus G. Morley of the Carnegie Institution of Washington. He accompanied Morley to Central America in 1921 as a mule skinner, thus becoming the first and only relative who has worked for any Carnegie foundation. Their journey across the base of the Yucatan peninsula was long and arduous. Afterwards Ricketson returned to Arizona for the summer, swearing never to set foot in the tropics again.

The following year, however, the enticement of a voyage to Tulum on the east coast of Yucatan brought him back in the Maya field. By this time, his talent for drawing and mapping had become recognized and he was beginning to take a technical interest in archaeology. On the 1922 expedition he made detailed maps of Tulum and Naranjo and worked on architectural surveys. Also he visited Uaxactun for the first time. After returning to the United States, he made his first voyage to Brazil to attend the XX International Congress of Americanists at Rio de Janeiro.

In 1923 Ricketson returned to the jungles of the Peten with W. A. Love and made the first accurate latitude and longitude surveys of the Maya cities. In the summer, with J. A. Jeancon, he covered a large part of the Southwest for the National Geographic Society, collecting samples for tree-ring datings. It was Ricketson who conceived the idea of taking borings in ancient beams at Oraibi and overcame local opposition by placing turquoise offerings in them.

(Continued on next page)

The next year was a busy one. After accompanying Frans Blom to Uaxactun, he carried out his first independent excavations — at Baking Pot, British Honduras — and he ended the field season at Chichen Itza, Yucatan, where the big Carnegie Institution program was getting under way. He also took his M.A. at Harvard.

The 1925 season again saw Ricketson at Chichen Itza, where he worked on repairs of the Caracol and the Temple of the Four Lintels and drawings of bas reliefs in the Northeast Colonnade. In August he married Miss Edith Hill Bayles from whom he was divorced in 1941. They went to Europe on their honeymoon and worked for some time in the British Museum.

In 1926, the Carnegie Institution of Washington negotiated a new contract with the Guatemalan government which initiated many years of excavation at the Maya ruins called Uaxactun with Ricketson in charge. Today there is an airport and a village with a post office at the site. At that time there was nothing, not even an adequate water supply. Everything — workmen, equipment and provisions — had to be transported from Belize by water in small boats and then on foot or mule back through the jungle for several days. Food shipped from the United States had to be ordered long in advance and so packaged that mules could carry it. Houses had to be built, crops planted both for men and mules. Ricketson, with his varied experiences and talents, was uniquely fitted for the task of successfully organizing the first big archaeological excavations in the tropical jungles of the New World.

Published accounts of Uaxactun are listed in the appended bibliography, and subsequent reports by A. L. and R. E. Smith have appeared. Ricketson's active leadership in the field terminated in 1929, when, after accompanying Col. Charles A. Lindbergh as observer on the pioneer reconnaissance of the Maya lowlands by plane, he moved to Guatemala City. There he spent a large part of the next seven years.

There were various reasons for this move. Ricketson's health had been impaired by long years in the jungle and he clearly needed to live in a more equitable climate. Also, the time had come to start studying the artifacts unearthed at Uaxactun, for which purpose he established a laboratory, which later was expanded on several occasions. Furthermore, a plan was to be set up for field work in the Highlands. Ricketson's recommendations, published in 1931, were subsequently carried out for the most part by other members of the Carnegie Institution staff.

The next few years were devoted largely to the preparation of the Uaxactun report, which served as a Ph.D. thesis at Harvard in 1933 but was not published until 1937. During this period he made reconnaissance trips to various parts of Guatemala. He also undertook several minor excavations — twice at Quirigua, also at Kaminaljuyu on the outskirts of Guatemala City and at San Agustin Acasaguastlan.

In the spring of 1936, Ricketson left Guatemala for good, moving to New Mexico and, in the spring of 1937, to Ricketson's Point, South Dartmouth, Mass., where his family had lived for over two centuries. The following year he settled in Cambridge where he undertook a study of environmental problems bearing on the Maya area. In 1940 he obtained a leave of absence to attend to personal affairs and, after his divorce in 1941, he married Miss Anne Riggs.

At that time Ricketson had worked for the Carnegie Institution of Washington longer than any other individual except Dr. Morley. In the fall of 1941, however, his long career with the Institution was broken under circumstances he resented and he decided to retire from archaeology. Again he moved to Ricketson's Point, South Dartmouth.

During the war, in 1943, Ricketson was sent to Manaos, Brazil, with the imposing title of "Deputy Expedition Leader, Rubber Exploration Defense Supplies Corporation, American Republics Aviation, Reconstruction Finance Corporation." After some time in Brazil, however, he realized that the program was of little value and he resigned.

At the beginning of 1945, the Ricketsons moved to Boston and in April they made a trip to Yucatan, where they were the guests of Dr. S. G. Morley. Subsequently Ricketson set himself up as an illustrator and draftsman with an office in Cambridge, a business enterprise which was immediately successful. He illustrated books such as Hooton's *Up From The Ape*, as well as drawings for commercial advertising. Eventually, however, he again retired to South Dartmouth.

In spite of his rural life, Ricketson never lost his basic interest in archaeology and travel. In 1946, he delivered a series of lectures on Latin America under the auspices of the Boston Pub-

lic Library. For two winters he and his wife cruised to Florida and back in a 36-foot motor sailer. His last field work was the excavation of a colonial fort for the Old Dartmouth Historical Society. At the time of his death, he was hoping to enlist with some archaeological expedition to Central America for the winter of 1953.

It is typical of Ricketson's career as an archaeologist that he was the first in many and diverse achievements. He was on the first expedition devoted exclusively to the study of dendrochronology in the Southwest. He made the first adequate maps of many Maya cities and the first latitude and longitude surveys which located them accurately. He was an observer on the pioneer air-reconnaissance flight over the Maya lowlands. He was among the first to excavate at Chichen Itza, and he planned and initiated the Carnegie Institution's program in the Guatemalan highlands. His outstanding achievement was at Uaxactun where he excavated for years under most difficult conditions. As a result, he was one of the first to demonstrate the existence and nature of pre-classical Maya culture.

In regard to Ricketson's personality and character, "He was," states Professor E. A. Hooton, "one of the most charming and friendly men whom I have had the privilege of knowing. He was essentially straightforward and simple — in contrast to being devious and complicated — in his thoughts and in his behavior. He was, beyond most persons whom one knows, loyal in his relationships to his work and to his colleagues. His modesty was so marked as to constitute something of a handicap in his profession. People sometimes were inclined to take him at his own very humble estimate of himself, for his capabilities were in fact far greater than he was ready to admit."

Ricketson was a man of medium height, small boned and strongly muscled. He not only was an able illustrator, draftsman and surveyor but was dextrous with all tools. He was also an expert in navigating small boats as well as the handling and packing of mules. He was the most considerate travelling companion I have ever known, thoughtful, inventive and indefatigable. These were the qualities he needed, for life in Central America was primitive when he started work. Even in the cities, food was poor and accommodations inadequate. Apart from ox carts in the cities, all transportation was by pack mule or horse or by tump line on human backs. In the bush there were no resources except what an outfit carried with them. Ticks, fleas, malaria and dysentery were accepted and unpreventable evils. "To Dr. Ricketson's ability," wrote Dr. A. V. Kidder, "as an organizer and leader of expeditions into difficult country, and to his skill as a field archaeologist, is due a very large share of our present knowledge of the Maya Old Empire." [1]

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FACTS AND COMMENTS

THE ASH COULEE SITE

During the summer of 1936 the Montana Archaeological Survey,* then under the direction of the late H. Melville Sayre, investigated a campsite on the ranch of John Trask about nine miles above the mouth of Ash Coulee, a partly subterranean tributary which enters the Yellowstone River about three miles above Terry, Montana. The excavation was under the immediate supervision of Raymond Thompson. Due to unexplained circumstances field notes of this investigation were not preserved. Description of the manner of excavation was obtained from Thompson who excavated the site in a thoroughly scientific manner and who is not responsible for lacks in documentation. The writer was not present during the investigation and has seen only the artifacts in the Survey's collections. Though documentation is meagre, the recovered material is significant enough to the problem of westward movements of prehistoric ceramic cultures into the northwestern Plains to warrant description.

The site lies on a low terrace just to the west of Ash Coulee and near the Trask ranch house. Over an area of less than an acre a heavily charcoal impregnated, shallow surface stratum contained the artifacts. A grid was laid out over a portion of the area and the culture bearing material was removed and screened. Remains of several fires were noted, but no other structures. An open, unstratified camp with impermanent dwellings is indicated.

One hundred and twenty-three potsherds were found. These vary from light to dark gray. Paste is medium to coarse with occasional tendency to convolution. Crushed granite or sand temper varies from almost invisible particles to those almost .1 inch in diameter. The ware is hard and occasionally overfired to a buff color. Maximum thickness is .3 inch and minimum thickness is .1 inch; average is .25 inch. Pseudo-slipping is usual and large particles of temper frequently protrude through the surface. Surfaces are rarely perfectly smooth and appear dull. Striations are frequent on interiors and exteriors. Thirty-six sherds are undecorated. Fifty-seven are grooved or thong wrapped paddle impressed (Fig. 24, *1-5*). Grooves are vertical or oblique, and are frequently partly smoothed away. Occasionally partly smoothed grooves appear under other designs. Grooves and ridges average about .12 inch in width and the former may be flat, ovoid, or round bottomed. Twenty sherds bear roughly executed incised lines, some made with a pointed tool and others with a small, round ended instrument (Fig. 24, *7-9, 11*). Most suggest bands of vertical, oblique, or horizontal lines on or near vessel necks. Incisions are .02 to .1 inch wide and .3 to .1 inch apart. One rimsherd and one shoulder-neck junction have vertical, exterior brush roughening (Fig. 24, *10*). Two sherds bear well made, parallel lines of cord impressions (Fig. 24, 6). Cord is .08 inch wide, twisted dextrally of two strands. Lines are oblique and horizontal respectively and .08 and .05 inch apart. One is apparently part of a band around the top of a neck. Twelve sherds bear lines of punctates (Fig. 24, *12-20*). All but one series are on tops of lips and one on an exterior just below a lip. Five are rows of hemi-conical punctates. The largest is .4 inch long and .2 inch wide at the base. The smallest is .2 inch long and .1 inch wide at the base. One has the long axis of the punctate perpendicular to the circumference of the vessel while the others are more or less oblique. Five series of punctates are made by pressing some narrow, square cornered object into the top of the lip. In 2 cases the treatment extends all the way across the lip while in 3 it begins at the exterior and stops just short of the interior. The first 2 are perpendicular to the circumference of the vessel and the latter 3 are oblique. Widths vary from .15 to .06 inch. One flat lip has a series of oblique impressions which appear as if they were made by pressing a bone awl point obliquely into the clay. The punctate series on a lip exterior consists of smooth, semi-spherical depressions which appear as if they were made with a smooth round pebble. They are .22 inch in diameter and .3 inch apart. Eighteen rimsherds have 10 kinds of cross sections. Of type 1 there are four specimens; types 2 and 4, three specimens; type 9, two specimens; and of the others, one specimen each. The single restorable neck represents a vessel about 7.7 inches in orifice diameter (Fig. 24, *1*). It has a slightly everted and slightly concave neck. The lip is turned back upon itself so that its top is oblique, with an exterior overhang which is waved by a series of indentations .25 inch wide and .2 inch apart. The small portion of the shoulder extant has an incised design of vertical and oblique lines.

There are 216 chipped stone artifacts, some of which are too badly broken to be identified.

The most common projectile point (45 specimens) is side notched with a concave to straight base and convex blade edges (Fig. 25, *1-4*). Chipping is skillful and cross sections are smoothly lenticular. Average length is 1.1 inches, width is .55 inch, and thickness .1 inch. Several rather blunt specimens appear to have been resharpened. One basalar portion is 1.1 inches wide and, if proportioned like the others, would have been at least 2.1 inches long. Twenty-three are jasper, 12 flint, 9 chert, and 1 obsidian.

Next most common (19 specimens) is a triangular, corner notched point with convex blade edges (Fig. 25, 5-9). Bases are either concave or convex, the latter being ground smooth. Chipping is skillful and cross sections smoothly lenticular. Maximum length is 2.2 inches, minimum .9 inch. Maximum breadth is .9 inch, minimum .8 inch. Maximum thickness is .25 inches, minimum .15 inch. Nine are flint, 5 are chert, 4 are jasper, and 1 is obsidian.

*The Montana Archaeological Survey was a Work Projects Administration Project sponsored jointly by the University of Montana and the Eastern Montana Normal School.

Small blades (32 specimens) with flat or concave bases and convex lateral edges are usually skillfully flaked and lenticular in cross section (Fig. 25, *10-13*). They are very similar in shape to the side notched projectile points except that they average slightly larger; flat rather than concave bases are proportionately more frequent. Two have a single notch at one side near the base. They may have been hafted knives or projectile points. Several roughly chipped examples are probably projectile point blanks, though most appear to be finished artifacts. Average length is 1.3 inches, width .6 inch, and thickness .1 inch. Eleven are jasper, 10 are flint, 10 are chert, and 1 is agate.

Three plano-convex, snubnosed, end scrapers are pressure flaked throughout while one is made of a flake with little alteration other than the pressure flaked cutting edge (Fig. 25, *15-16*). Two have bilateral constrictions or notches. The largest is 1.9 inches long, 1.1 inches wide, and .4 inch thick. The smallest is 1.1 inches long, .8 inch wide, and .3 inch thick. Three are flint and 1 is chert.

Twenty bifacially flaked blades were probably used as knives. Five are long and narrow, usually being ovoid or occasionally flat on one end. They are pressure flaked and have sharp edges. One fragmentary specimen is bilaterally notched near one end. The largest complete specimen of this type is 3.1 inches long, .9 inch wide, and .4 inch thick. The smallest is .9 inch long, .4 inch wide and .2 inch thick (Fig. 25, *19*). The rest vary from this type to a broader form with a pointed end and a rounded, flat, or irregular base. One of these is unilaterally notched near one end. The largest of these is 3.3 inches long, 1.6 inches wide, and .45 inch thick. The smallest is 1.1 inches long, .9 inch wide and .1 inch thick. Some of these latter are partly percussion flaked with a pressure retouch (Fig. 25, *18, 20*). Nine of the blades are chert, 5 are flint, 3 are quartzite, 2 are jasper, and 1 is basalt.

Four fragments of large, ovoid, bifacially percussion flaked blades may have been knives or choppers (Fig. 25, *21-22*). Two of these show an additional pressure retouch around the edges. The largest is 2.9 inches wide, .5 inch thick, and was probably originally about 4.7 inches long. The smallest is 2.1 inches wide, .3 inch thick, and was probably originally about 3.8 inches long. Two are flint, 1 is chert, and 1 is basalt.

One peculiar object is of doubtful function (Fig. 25, *17*). Superficially it appears similar to a tanged projectile point from which the point has been broken. Instead of being broken, however, this end has been brought to a chisel-like cutting edge. Throughout it is smoothly pressure flaked. It is of brown flint and 1.2 inches long, .7 inch wide, and .15 inch thick.

One unifacially pressure flaked plano-convex drill is made of a long narrow flake retouched on one side, the other side being the smooth face of the flake (Fig. 25, *14*). The cutting end is round while the somewhat narrower proximal end is flatter. The cutting end and side edges are ground smooth as if it had been used in drilling some hard, abrasive substance. It is of brown flint and is .7 inch long, .3 inch wide and .1 inch thick.

There are 2 fragmentary metapodial scrapers. One is made of the distal end of an elk metapodial (Fig. 25, *23*). The shaft has been beveled on the anterior side to a blunt chisel-like cutting edge which has five serrations made by five pairs of converging grooves extending along the anterior and posterior sides of the edge and meeting to form a notch at the edge. Original length was probably about 7.5 inches. The other is of deer metapodial and similar except that it is without serrations (Fig. 25, *24*). Original length was probably about 6.5 inches.

Two objects of bison rib appear to be knife handles. One is a section of rib from which both the anterior and posterior edges have been removed exposing the cancellous bone (Fig. 25, *25*). This left a section .9 inch wide and .6 inch thick. One edge of this has been beveled back for a distance of 1.9 inches. On the opposite side the cancellous bone has been excavated to form a groove 3.0 inches long, .3 inch wide, and .6 inch deep. The other end of the implement has been broken off leaving the fragment 4.5 inches long. It has been carefully smoothed and polished throughout. The second is also made from a piece of rib from which the anterior and posterior edges have been removed (Fig. 25, *26*). This is 4.5 inches long, .8 inch wide, and .5 inch thick. Both ends are smoothly ovoid. At one end the cancellous bone has been excavated to a depth of 1.2 inches.

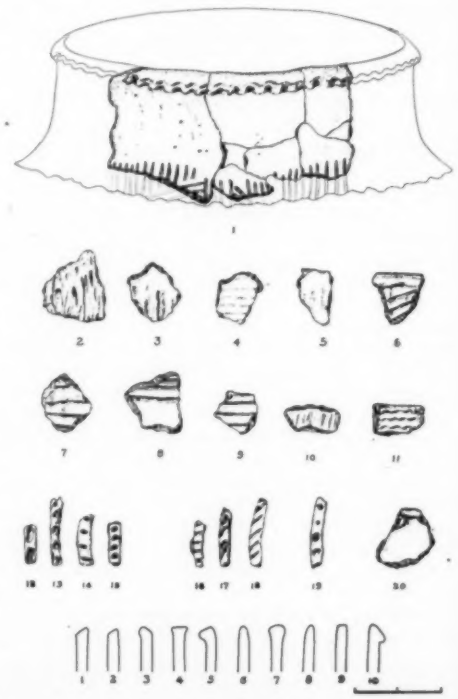

FIG. 24.

Grooves are cut in the anterior and posterior edges and both sides near the other end. This may have been to provide a more secure hand hold.

There are 6 fragmentary awls. Four are slender broken points. One broken fragment has been made from the proximal end of a deer metapodial. The bone has been split and one articular process made into the handle end with the point probably about midway down the shaft. In this case the handle end has been so smoothly ground as almost to obscure the original outlines of the articular process. The point is missing (Fig. 25, 27). The other is made of a split section of the distal end of a deer metapodial. The roughest edges have been smoothed and a point ground. Originally it was probably about 3.5 inches long (Fig. 25, 28).

Five fragments of stone chipping tools are made of bison ribs. All are more or less round on the end and are well smoothed over all (Fig. 25, 30). Two are of antler and worked over the whole surface. They are vaguely rectangular in cross section and are brought to a round point at one end (Fig. 25, 31).

Nine fragmentary or complete bone beads are made from cylinders cut from the shafts of long bones. These are all carefully smoothed and polished over all. The largest is 1.2 inches long and .8 inch in diameter while the smallest is .5 inch long and .25 inch in diameter.

FIG. 25.

Some appear as if they might have been made from deer metacarpels (Fig. 25, 29, 32).

One fragment of bison scapula appears possibly to have been part of a bison scapula hoe. It is a section near the distal end of the blade. The distal edge has been ground round and smooth, the acromnion process has been removed, and its scar ground smooth. As the fragment is small, it cannot be proven to be part of a hoe.

There are 2 pieces of shell. One is a small fragment of *Unio* which appears to have been unworked. The other is a thin rhomboidal piece of unidentified shell .5 inch long, .4 inch wide, and .02 inch thick. In it are two holes .4 inch apart and .04 inch in diameter. It could have been a button, bead, or ornament sewed on clothing (Fig. 25, 33).

This material provides one minor body of data of significance to the extensive problem involving the westward movement in late prehistoric times of sedentary ceramic-agricultural peoples from the north-eastern Plains into the north-western Plains and Mountain regions. This movement seems to have involved the gradual abandonment of agricultural and ceramic aspects of culture and their replacement by nomadic hunting. Though several groups undoubtedly were involved in this movement, the Crow are among the better documented. These people were formerly with the Hidatsa on the Missouri where they presumably participated in a similar way of life. In late prehistoric times they moved westward to be found historically on the Yellowstone as fully developed, non-agricultural, non-ceramic buffalo nomads. The Hagen Site, which lies near Glendive, some twenty miles down the Yellowstone from the Ash Coulee Site previously has been suggested as being evidence of this Crow movement revealing the group in a transitional state between agricultural and hunting adaptations.[2]

It is suggested that the Ash Coulee material probably represents further evidence similar to that provided by the Hagen Site. Though the collection is probably too small ever to be identified with accuracy, it is of some significance that practically all of it falls within the ranges of variation at the Hagen Site. Of the non-ceramic material described here only knife handles for end-hafted knives, the peculiar item illustrated in Figure 25, 17, the double pierced shell bead, and the scraper made of deer metapodial are not also found at the Hagen Site. All of the ceramic material is reproduced among the vastly larger collections at the Hagen Site. However, the frequencies may be different, though it is impossible to determine this from the small Ash Coulee sample. What appears to be greater emphasis on incising and lesser emphasis on cord marking may be most significant.

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[2] William Mulloy, *The Hagen Site, A Prehistoric Village on the Lower Yellowstone*, University of Montana Publications in the Social Sciences, No. 1, 1942.

UNDERGROUND KIVA PASSAGES

Florence Hawley Ellis (1952) has brought some new ethnological evidence from the pueblo of Jemez to bear on the question of certain archaeological features found in a number of prehistoric southwestern kiva structures. Details are given of various acts of legerdemain for the magical production into the center of the kiva of small animals and shelled corn apparently out of nothing. These are ritual shows put on by the initiated to impress the lay spectators at the periodic kiva dedications that occur in Jemez. Ellis describes the use of secret pits in the kiva floor as well as other mechanical devices to produce these special effects. She correctly, in my view, expresses the opinion that her ethnological data lend substantiation to Reiter's speculation that underground passages and trenches such as he uncovered in connection with the Rinconada big kiva in Chaco Canyon were aids to magical effects so that, "Participants in kiva ceremonies could appear as if from the interior of the earth." (Rieter, 1946, p. 189). Ellis reports that she was told that in the past an underground passage used to run from the outside into the kiva to give entrance to the person impersonating the Corn Mother and, presumably, for other deity representations (Ellis, 1952, p. 158). She was apparently given to understand that such passages no longer function at Jemez.

Inasmuch as Ellis' point is of considerable significance for Southwestern archaeology, it may be worthwhile for me to report a small bit of corroborating information on a neighboring Keresan Pueblo. My work was on law and I avoided questions on ceremonial as a rule but I did not dodge that which was spontaneously offered.

In August, 1946, I took two high-ranking society officers on a junket to Chaco Canyon and Mesa Verde. In commenting on the open spaces between the round kiva walls and the rectangular walls enclosing them in the house portion of the east side of Pueblo Bonito, and on the tunnels leading into some of the Mesa Verde kivas, one of them expressed himself as follows:

"Do you know what those are for? Those are for the kiva magic. The priests can dress up in those little rooms and come right into the kiva. Nobody knows where they come from. It looks just as if they come right out of nothing.

"They do some wonderful things in the kivas. I sure wish you could see it yourself. You would hardly believe it. They can make ripe corn grow right there in the kiva in a single night — from seed to the standing corn. Sometimes they will even make something turn into a deer or a bear. That's what those tunnels are for, and those little rooms. These things go on in our pueblo right now."

Then, shaking his head, he added, "Gosh, it's wonderful that things haven't changed at all in all the time since our ancestors were living here (Chaco Canyon)."

The next morning before we left Chaco, he and his confrere reverently went off by themselves to Chetro Ketl where they placed a prayer-stick in the walls of the ruin. When the ritual was over he said, "We made a prayer for our ancestors who used to live here long ago." Then with a chuckle he added, "Some day some of those archaeologists are going to find that prayer-stick there. They'll think they've found something real old." *Caveat emptor!*

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REITER, P.

n.d. Form and Function in Some Prehistoric Ceremonial Structures in the Southwest. (Ms)

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SOME THOUGHTS ON CHIBCHA CULTURE IN THE HIGH PLAINS OF COLOMBIA

The Chibchas, whose habitat was in the high plains of the eastern cordillera of the Andes in central Colombia, are usually classified with the Maya and Inca as representatives of the highest civilized peoples in native America. Unlike the Maya and Inca, who left abundant testimony of their greatness in the form of spectacular religious monuments, cities, public works, and an enormous array of material possessions, the reminders of the Chibcha are not only difficult to find, but once found, they are unimpressive. Chibcha greatness is attributed to their achievement of political states, each dominated by a ruler who controlled the destiny of those people within his domain.

Using cultures of high political and religious achievement as a basis for comparison, it may be inferred that the Chibcha should have had a respectable history as a requisite for advanced political organization and a complex material culture. Both the Maya and Inca demonstrate these qualities thereby providing a foundation for an understanding of the forces at work. The Chibcha, on the other hand, yield no such evidences. This raises the question as to the validity of our ideas about them.

The domination of the Chibchas in the 16th century by Jimenez de Quesada in less than two years and with less than 200 soldiers was a feat unparalleled in New World conquest. So complete has Chibcha submergence been that the opportunity of studying surviving groups has been removed. Even the language became extinct some two hundred years ago. Only two sources of information are available to us for appraising this group: documentary accounts and archaeology.

At the moment, our understanding of the Chibcha stems almost entirely from a handful of original sources written within the first century of the conquest, and a larger number of documents written subsequently but based on the earlier literature. As Kroeber has pointed

out,[1] Chibcha source material is limited, poor in quality, and "the anthropological value of these authors is in general in inverse relation to their lateness."

Archaeological studies have been spotty and concentrated, unfortunately, on burials. While this work has been productive of some material remains, most of it is as yet unrelated and little has been contributed towards an understanding of Chibcha prehistory. The problem, as I see it, is to introduce systematic archaeology bearing on questions of the nature of the culture, regional differences, and chronology.

The observations which follow are based on six months of archaeological study in the Chibcha zone during 1949-50, made possible by a Guggenheim Fellowship, a grant-in-aid from the Viking Fund, and the cooperation of what was then the Instituto Etnológico Nacional of Bogotá. During this period, travel in the savannahs of Bogotá, Fúquene, and Sogamóso aggregated 6,000 miles, the better known sites were visited and some new ones were added to the known list. Excavations in three habitation areas in the Bogotá savannah, the southernmost Chibcha division, were conducted during November to February of 1949-50. These were: in the National Archaeological Park at Facatativá where the last Zipa, Tisquesúsa, was slain in 1538 by the soldiers of Jimenez de Quesada; in Pueblo Viejo, near Facatativá, and near Gachancipá. The primary aim of this work was to shed light on the problem of cultural chronology.

On the basis of the excavations, three ceramic periods have been proposed for the extreme southwest frontier of Zipa's domain, namely, Recent, Colonial, and pre-Conquest.[2] Deep excavations under natural shelters, the logical places for encountering traces of long occupation, and the study of numerous eroded sites, failed to yield either heavy cultural deposits of Chibcha origin necessary for sound chronology building, or human evidences in physiographic situations indicative of the passage of time. The conclusion reached therefore with respect to the pre-Conquest remains, is that even such material is recent, limited possibly to a few centuries before the arrival of the Spaniards.

I was shown the best and largest ruins the Chibcha area offers, from Paz de Rio near the northern limits of this tribe's territory to the southern savannah bordering Panche territory. There are no great urban centers, as we might expect among a sedentary farming people of supposed high population density and a strong political organization. On the contrary, villages were small; religious and domestic architecture lacked elaborateness and permanency, burials are in simple pits, and the usual signs of intense and prolonged living were absent. Though the Chibcha had gold and emeralds and a near-monopoly of salt, their material culture, both as to complexity and technical excellence was only average. Ignoring for the moment the implications of the documentary sources, the appraisal of the Chibcha by archaeological methods alone would identify a culture of only moderate achievement, certainly not superior to and in some cases even inferior to other Colombian tribes.

There are, it seems to me, a number of explanations why the Chibchas did not develop. The most important of these is the shortness of time. As already stated, the archaeology everywhere is thin and the expectable diversity of culture remains arising from long occupation is lacking. Two or three centuries of pre-Conquest history would appear to be sufficient time to account for all known regional and minor chronological differences. If, on the other hand, one holds to the present view of Chibcha greatness, it must be assumed either that their rise was phenomenally fast or that settlement of the savannahs was late and that the basic steps towards cultural and political unity had been made elsewhere. As yet we have no trace of such a locality.

Another factor is isolation of the Chibcha habitat. While the geographic barriers were not great enough to completely insulate them, the fact remains that contact was established, mostly hostile, with only the nearest of neighbors and that distant groups, as those in the Cauca Valley were virtually unknown to them. They were marginal to any probable connecting route between Central America and Peru.

A third restraining influence on the Chibcha was that of ecology. From our point of view, they occupied the most favorable plateau in Colombia, endowed with all apparent requisites for promoting cultural growth, an abundance of fertile agricultural land, two seasonal rainy periods, a brisk climate, and freedom from noxious pests and jungle fevers found in the tropical regions. But this impression of richness needs to be tempered.

The broad level plains in the Chibcha country are the beds of Pleistocene lakes. Remnants of these lakes still survive, as at Fúquene. Sizable areas of bottom lands are marshes today and larger sections become inundated during the rainy season. Drainage projects and the wide planting of eucalyptus trees has done much to reduce the shallow water table during recent times thereby greatly extending the acreage. It is doubtful if the savannahs came into any real economic importance until after the introduction of cattle, as most of the land, even now, is devoted to grazing.

Nevertheless, such centers as at Funza, Fontibón, Chia, and Cajicá do demonstrate that the Chibchas made use of bottom lands in favored localities but the number of sites in the savannah proper is small, as compared with those on the mountain slopes.

Slope farming called for terracing and this the Chibchas did. The areas which I had an opportunity to see where terraces were best developed are at Pueblo Viejo near the town of Facatativá, between Tocancipá and Sopó, west of Chocontá and near Tunja. By Peruvian standards Chibcha terracing was a weak effort and far less extensive with little apparent effort to achieve maximum utilization of the ground, and technically inferior. It might be argued that terracing was adopted

[1] Handbook of South American Indians, *Smithsonian Institution, Bulletin* 143, Vol. 2, pp. 897-98, 1946.

[2] A detailed report of this will appear in the near future.

after the many hundreds of square miles of bottom lands were put under cultivation and that mountainside farming became necessary by reason of overpopulation. In view of what has already been said, this idea may be rejected.

On the contrary, it would appear that terracing was forced upon them as the only practicable means of surviving in a country which appears to but does not have, unlimited agricultural possibilities. In this situation lies the probable answer for Chibcha failure to achieve substantial urban centers.

Other factors which must be recognized as having a bearing also on culture growth are soil thinness, soil deficiencies, and altitude which affected the length of the growing season. In the bottom lands, soil thickness varies considerably, ranging from a meter (rare) to a matter of centimeters. As seen in numerous cuts, both artificial and natural, the savannah has only a thin productive soil capping on the tight sterile deposits of lake origin. Shallow soil is also characteristic of most of the mountain slopes. While Chibcha terracing may have been effective in checking erosion, it also resulted in piling up the good soil on the down slope of terraces and denuding the up slope of its fertile soil cover within any given terrace, thereby reducing productivity. Numerous places were observed, both on the savannah floor and on the slopes where the shallow furrows of ox-drawn ploughs had more than penetrated the topsoil.

The soil of the altiplano is black, rich in humus and highly acid. Native vegetation flourishes, but for the successful growth of domesticated food crops, some form of fertilization is necessary. A soil expert told me in Bogotá "You can see a cow standing in belly-high grass but starving to death." Ashes and commercially produced lime fertilizer are widely used today in potato-culture, brought in from a considerable distance since the local geology makes no lime available. Unless the Chibchas were well versed in the use of fertilizers, and for this there is no evidence, they could not have derived maximum benefits from the soil.

The growing season at 8600 to 10,000 feet above sea level for corn varies from seven to ten months and for potatoes, from six to eight months. A single annual crop on any parcel of ground was therefore the rule and growing plants were exposed for a long time to the vagaries of weather and pests. These factors, together with inferior nutritional qualities of the produce, would be certain to leave their marks on population and cultural vitality. Under these conditions at best, the most one could expect would be a scattered rural population with little opportunity for urbanization and consequent political unification.

Estimates of the population in Chibcha territory at the time of the Conquest are extremely difficult to make. These range from a million or more to conservative 120,000. A recent estimate[3] gives a figure of 300,000, or 1,070 persons per 100 km. This is a population density vastly exceeding that of all other South American tribes. It must be remembered that we are dealing with a supposedly sedentary population, dependent almost entirely on agriculture for subsistence. An inevitable by-product of this type of existence is rubbish and if we assume even the lowest population figures to be correct, there should be an abundance of trash, especially if time was involved in the development of culture. But herein lies the paradox in Chibcha archaeology. Such deposits of trash appear not to exist. No great middens of refuse have been reported as are known, for example, from Peru, Central America, Mexico, or the southwestern United States. Even in the areas of greatest population density, as at Tunja and Sogamóso, refuse seldom exceeds a meter in depth. It may be argued that this was due either to the rural and therefore scattered pattern of life, or to a short history. There is doubtless truth in both situations, but nevertheless, the fact still remains that the archaeological evidence and the estimates of the population are in disharmony and that a substantial reduction of the minimum estimate of 120,000 would seem to be nearer the truth.

The conclusions which may be drawn from the foregoing assertions are somewhat contradictory to the present thinking about the Chibcha. While Chibcha origins are obscure, it may be postulated that a number of linguistically related tribes moved southward from the isthmian region into the eastern cordillera of Colombia not many centuries before the Conquest; that they adopted certain elements of the higher Andean culture, as terrace farming, and developed a predominantly rural pattern of life; that large cities were unknown among them; that the population density was below estimates and population growth was inhibited by environmental factors; that although political subdivisions or states were apparent in Spanish times, unification within each domain, let alone between the domains, was barely underway when the culture was snuffed out by the colonizers. The speed and completeness with which this took place, including the extinction of the language, can best be explained in terms of the foregoing conclusions. Chibcha territory was marginal to the main currents of Andean prehistory and it is my opinion that the Chibchas exercised little force and had little significance in the over-all picture of Andean cultures.

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[3] Steward, Handbook of South American Indians, *Smithsonian Institution, Bulletin* 143, Vol. 5, pp. 660, 663, 1949.

ON NOEL MORSS' "CRADLED INFANT FIGURINES"

Recently Noel Morss published several recumbent figurines (*American Antiquity*, Vol. 18, No. 2, 1952) and pointed out the area of distribution of this type giving examples of Mexican as well as North American origin. His interpretation was that they represent children strapped to their cradles.

As early as 1949 I published, in the first volume of "Selected Papers of XXIX International Congress of

Americanists" in New York, a paper on the same subject,[1] which, apparently, Noel Morss had not seen. I had assembled several similar specimens originating from a vast area extending from Ecuador to the Valley of Mexico and to Colima. The new point which Morss (who has never heard of kindred subjects in South America) makes in his paper, is the inclusion of North America in the same complex. The Nashville specimen (Morss, 1952, Fig. 74) differs only in size (it is 9 inches long). All the other figurines quoted by both of us are less than half that length.

The Nashville figurine does indeed show a child strapped to its cot. But Morss is wrong in his conclusion that children were always represented. By stretching the point we can agree with this concerning the Los Ortices figurine (Morss, 1952, Fig. 75, *a*) on account of the hand placed in the mouth; but the Pancitlan figurines (Fig. 75 *b*) represents without any possible doubt an adult figure, as do all those I have published. Vaillant's "person in bed"[2] with earrings is certainly not a child.

[1] LEHMANN (HENRI). Le personnage couché sur le dos: sujet commun dans l'archéologie du Mexique et de l'Equateur. T.I., pp. 291-98.

[2] VAILLANT (George C.). Excavations in Ticoman. Anthropological Papers of the American Museum of Natural History. Vol. 32, part 2. New York 1931: pl. LXIV, p. 363.

The statuettes belonging to the University of Pennsylvania Museum, which I had not seen in time to include in my article of 1949, but which I mentioned briefly in a footnote, seem to confirm my point of view. They are published here for the first time (Fig. 26). (The photograph used in Fig. 26 was made available to me by the Museum.) Figure No. 26, *a*, (29-51-111) from Esmeraldas, Ecuador in particular, depicts a young man of rank. An engraved band, upon which lies a pendant, circles his chest and arms twice. He is wearing a bonnet. Another Ecuador statuette Figure 26, *b* (29-51-89), undoubtediy also from Esmeraldas, represents a similar figure. There is a band round the chest and arms, upon which lies the pendant. The features are those of an adult. Statuette NA 2123, (Fig. 26, *c*) from Michoacan, shows a figure wearing a large garment, maintaining the arms against the body like a strait jacket, and two bands round it. The headrest is very apparent. Here again it is certainly not a child. The Aztec specimen in Figure 26, *d*, (11301) shows a figure strapped within an apparatus closed by a transverse bar by means of rather large bands. It has often been suggested that this apparatus is a cradle. But the legs extending beyond the apparatus exclude this hypothesis. It seems that it was not enough to enclose the body and the arms but it was found necessary to use an extra safety device.

Since I published my paper, I have seen another similar object of Huaxtec style, which considerably

FIG. 26. *a*, Man seated on bench, Ecuador, (29-51-111); *b*, baby tied to cradle board, Ecuador (29-51-89); *c*, Figurine, Michoacan (NA2123); *d*, infant in cradle, Mexico (1130). Height of *a* is 6½ inches. (University of Pennslyvania Museum photograph)

widens the area of distribution of this type inside Mexico (Fig. 27, *a*, *b*). It is a statuette 11.2 centimeters high, which is in the Museum für Völkerkunde of Hamburg (B 5717). It was collected at San Antonio, Cerro Cajete, by Strebel. The figure is also that of an adult to judge from the locks of hair spread over his head, from the nose ring (nariguera), and from the earrings and necklace placed over the two comparatively wide bands round the body. He is reclining on his back upon a board. The head is resting on a pillow. The arms are strapped. Under the legs is a thick bolster. The legs reach some millimeters past the bed. If we compare this statuette with those previously published, we find all the essential and characteristic elements which made us suggest that they represent sick people. Note that the Nashville statuette has neither headrest, nor a bolster under the legs like most of the others.

It seems that until a quite recent date the representation of an infant lying in a cradle was very widespread in North America, while it was uncommon or even inexistent in pre-Colombian Mexico and Ecuador. Yet among all the figurines we have mentioned the most ancient is Vaillant's "person in bed" found at Ticoman (but not *in situ*).

Therefore we can admit, and I agree with Morss, that the subject of the figure lying on its back originated in the Valley of Mexico; it first appeared in Ticoman. Then it spread to Colima and in the Huaxteca; during the Aztec period, it is found again in the Valley of Mexico. Towards the South, it is found in the coastal regions of Esmeraldas (Ecuador). It has already been stressed several times that the style of the latter region has an obvious relationship with that of several parts of Mexico. And finally the reclining figure is found in the North in certain parts of the United States (Tennessee), but here, as later in post-Colombian times, it takes the form of an infant lying in a cradle or on an ordinary couch.

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FIG. 27*a*. Figurine from San Antonio, Cerro de Cajete, Mexico (B5717). Length is 11.2 cm.

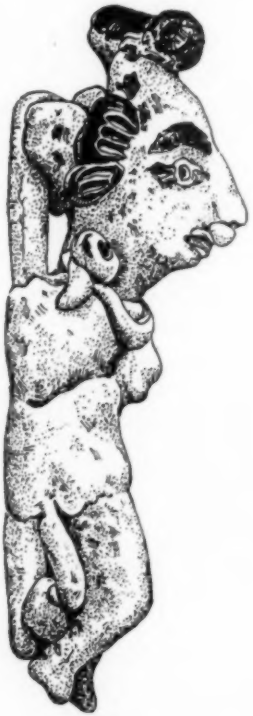

FIG. 27*b*.

ABOUT SLATE FIGURINES

In *American Antiquity* (Vol. 17, No. 3), Heizer reports "Incised Slate Figurines from Kodiak Island, Alaska." This COMMENT was concerned with a number of unusual incised slate fragments portraying human faces. Doctor Heizer was of the opinion that they were quite late, having come from the upper levels of stratified sites or from known recent sites.

FIG. 28 *a*.

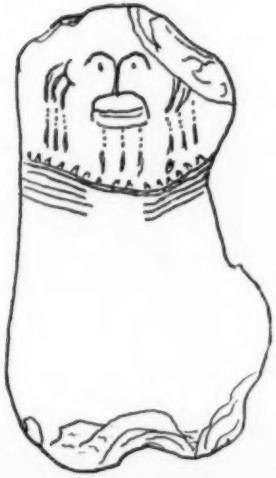

FIG. 28 *b*.

Comparing the features of these stylized portraits with Plate 17 "A Man of Kodiak" from Billings, London 1802 (reproduced here as Fig. 28 *a* with Heizer's Fig. 28, *b*), one cannot doubt that they are recent. The elements besides the stylized faces are easily recognized as beaded ear and chin ornaments, and the typical squared collar of the Koniag of 150 years ago.

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ADDITIONAL NOTE ON CHINESE SOAPSTONE CARVINGS FROM MESO-AMERICA

S. V. R. Cammann's interesting analysis of the Chinese stone carving found by Gann in a Maya site in Quintana Roo has indeed thrown some explanatory light on this, and other pieces of the same general type.

Zelia Nuttall (1910) mentioned a "soap-stone teapot" from the island of Sacrificios, and says that "it gave rise to much speculation, especially as similar ones were found by respectable authorities at Tepaca (on the ancient high road to Puebla) and in the Huaxteca." Nuttall says further, "The well vouched for fact that the teapot was actually found on the island of Sacrificios can doubtless be explained by the employment of the island by the Spaniards, during centuries, as a lading place for merchandise from the Philippines and China, after it had been brought overland by mule-back from Acapulco to Vera Cruz, to be shipped from thence to Spain."

The early trade between the Philippines and Mexico was certainly a fact, and that goods of Chinese manufacture were being transhipped before 1600 is attested not only by documentary records, but by the recovery from certain aboriginal coastal sites in California of large numbers of fragments of Ming porcelain deriving from a Spanish shipwreck of 1595 (Meighan and Heizer, 1952).

It would be worthwhile if some person would track down all of the known occurrences of soapstone carved objects of Chinese origin in Meso-America and submit them for expert opinion. If this is not done we may read, before long, that these pieces are of pre-Hispanic date and are evidence of trans-Pacific contact!

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CLOVIS FLUTED POINTS FROM SOUTHEASTERN ARIZONA

The primary purpose of this paper is to report the finding of two Clovis Fluted points in southeastern Arizona and hence to further define the geographical range of the hunting complex represented by these points. The secondary purpose is to define the characteristics of the two points in question, for they closely resemble the eight points found at Naco, Arizona.

Haury and others (p. 1 ff.) report the finding of eight Clovis Fluted points in the near vicinity of Naco, in southeastern Arizona. This (*American Antiquity*, Vol. 18, No. 1, p. 91) was the first reported find of these fluted points in this area. The importance of the find was emphasized by the fact that the projectile points were found in direct association with the skeletal remains of *Mammuthus* (*Parelephas*) *columbi* (Haury, "*The Naco Mammoth*," The Kiva, Vol. 18, Nos. 3-4, 1952, p. 17).

The evidence indicated that early man was present in this area at a time contemporaneous with mammoth. Heretofore it was believed that man in southeastern Arizona was earliest represented by the Cochise culture, (Sulfur Springs Stage), and that he was primarily a food gatherer (Sayles and Antevs, "*The Cochise Culture*," Medallion Papers No. 29, 1941, p. 30). The associations found recently at Naco now allows one to

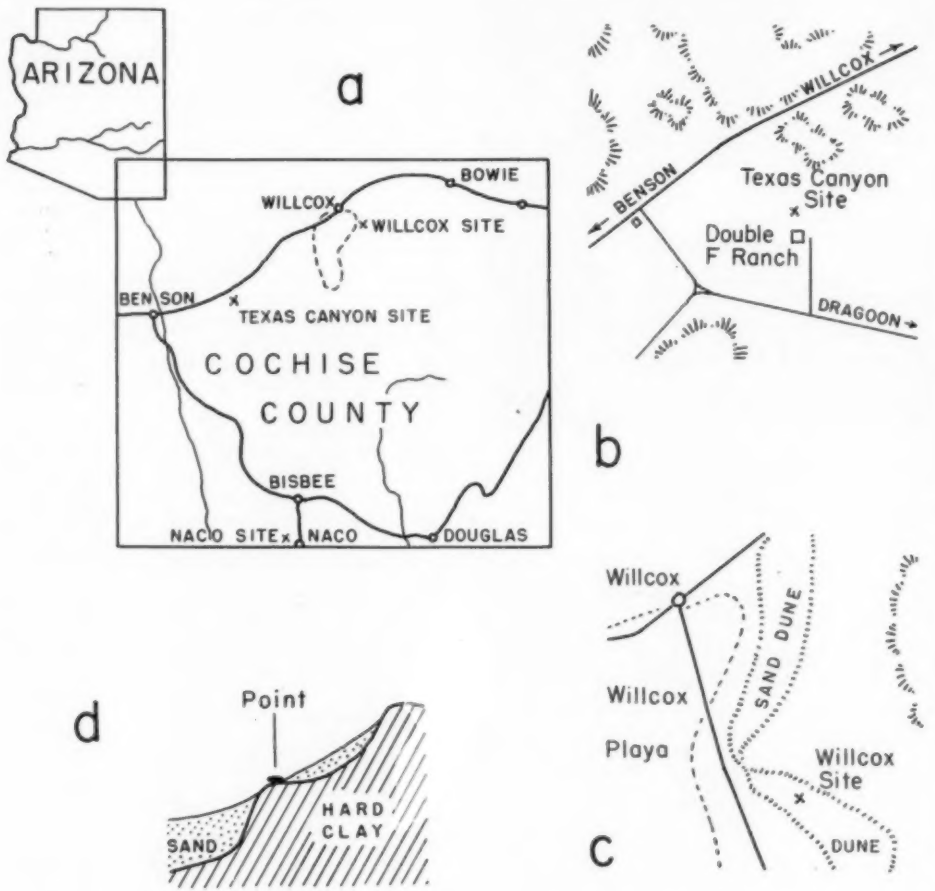

FIG. 29. Provenience of Clovis Fluted points found in southeastern Arizona. *a*, Cochise County is located in the southeast corner of Arizona. *b*, The Texas Canyon Site is located on the Double F Ranch in T15s, R23E, S10; *c*, The Willcox Playa site is located in T14S, R25E, S14; *d*, The Willcox point was found in a sand dune blowout lying directly on an old contact surface.

surmise that people representing the culture identified with artifacts known as Clovis Fluted points also ranged in this area. It is believed that these early peoples were primarily hunters. This data allows for the presentation of further hypothesis. Either the projectiles known as Clovis Fluted were traits of the same culture identified as Cochise which is represented in the minds of archaeologists by a complex of grinding tools significant of a food gathering culture — or — the two groups of people ranged the same area at the same time and one group was primarily a hunting group while the other was a food gathering group — or — that the Clovis Fluted complex preceded the Cochise complex. Either of these hypotheses needs a great deal more examination, but Antevs has expressed the belief that the Sulphur Spring Stage of the Cochise culture (Sayles and Antevs, *op. cit.*, p. 55) dated approximately 10,000 B.C. and he has recently suggested the same date for the Naco finds. (Haury, 1952, *op. cit.*, pp. 17-18).

The crux of the problem will be solved only when, through further investigation, a correlation between the two cultures can be made. Either material traits from both cultures must be found, beyond any reasonable doubt, at the same site, or evidence must be found to suggest that the two groups were independent entities which operated in the same area but under separate social controls.

The smaller of the two points, termed the Texas Canyon point, was found on the property of the Double F ranch near the Amerind Foundation, Inc., Museum. The accompanying map (Fig. 29) gives the detailed provenience of this projectile which was found on the surface. No cultural or faunal associations were found with it. It may well be possible that the point was carried to its present location in the wounded body of some animal.

The larger of the two points, termed the Willcox Playa point, was found in the month of February, 1953 by Mr. and Mrs. William G. Ferris of Fort Collins, Colorado, who were wintering in Willcox, Arizona. Upon finding the point they reported its location to the Amerind Foundation, Inc. This made it possible for staff members of the institution to survey the site in the company of the Ferris's. The projectile point impression, still fresh, was found in the clay exposure from whence they had taken it (Fig. 29, *d*).

The Willcox Playa site (Arizona:CC:13:1—Amerind Foundation, Inc., Survey System) is located on the eastern terrace of the Cochise playa on a sand-clay dune in the basin of a recent blowout. The spit is located four and one-half miles southeast of the town of Willcox on the east side of the Kansas Settlement Road (Fig. 29, *e*).

The blowout had removed, through eolian action, the surface sand stratum which presently covers most of the old lake terraces in the vicinity. This action exposed the old clay contact surface (Fig. 29, *d*; Fig. 32) thus exposing the Clovis Fluted point. An examination of the area immediately around the clay impression which the projectile point had formed failed to produce any cultural or faunal associations. Other blowouts on the same dune were exposing stone artifacts as well as plainware pottery but these could not be directly associated with the Clovis Fluted point.

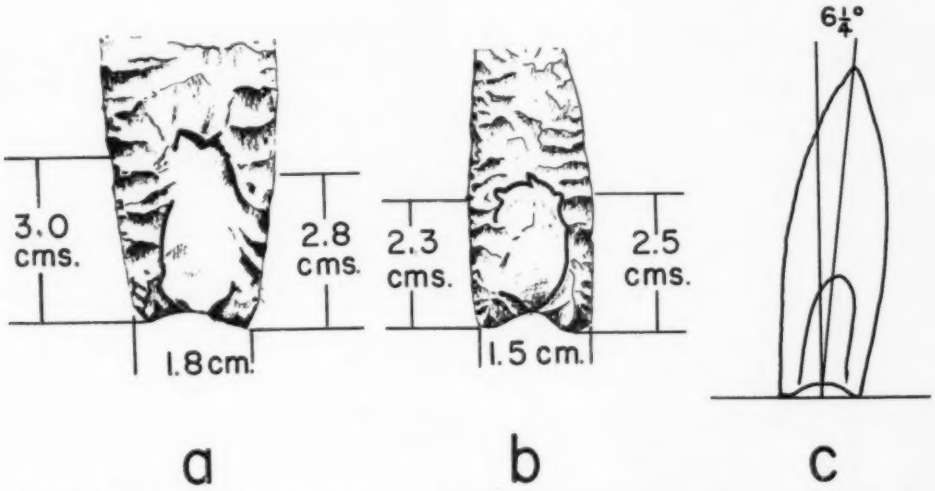

FIG. 30. Fluting, ground edge and angle of inclination of the fluted points from southeastern Arizona. *a*, The base and flute of the Willcox Playa point (Note that the final chipping overlaps the margin of the conchoidal depression of the fluting); *b*, the base and flute of the Texas Canyon point; *c*, the peculiar angle of inclination found to be characteristic of both points.

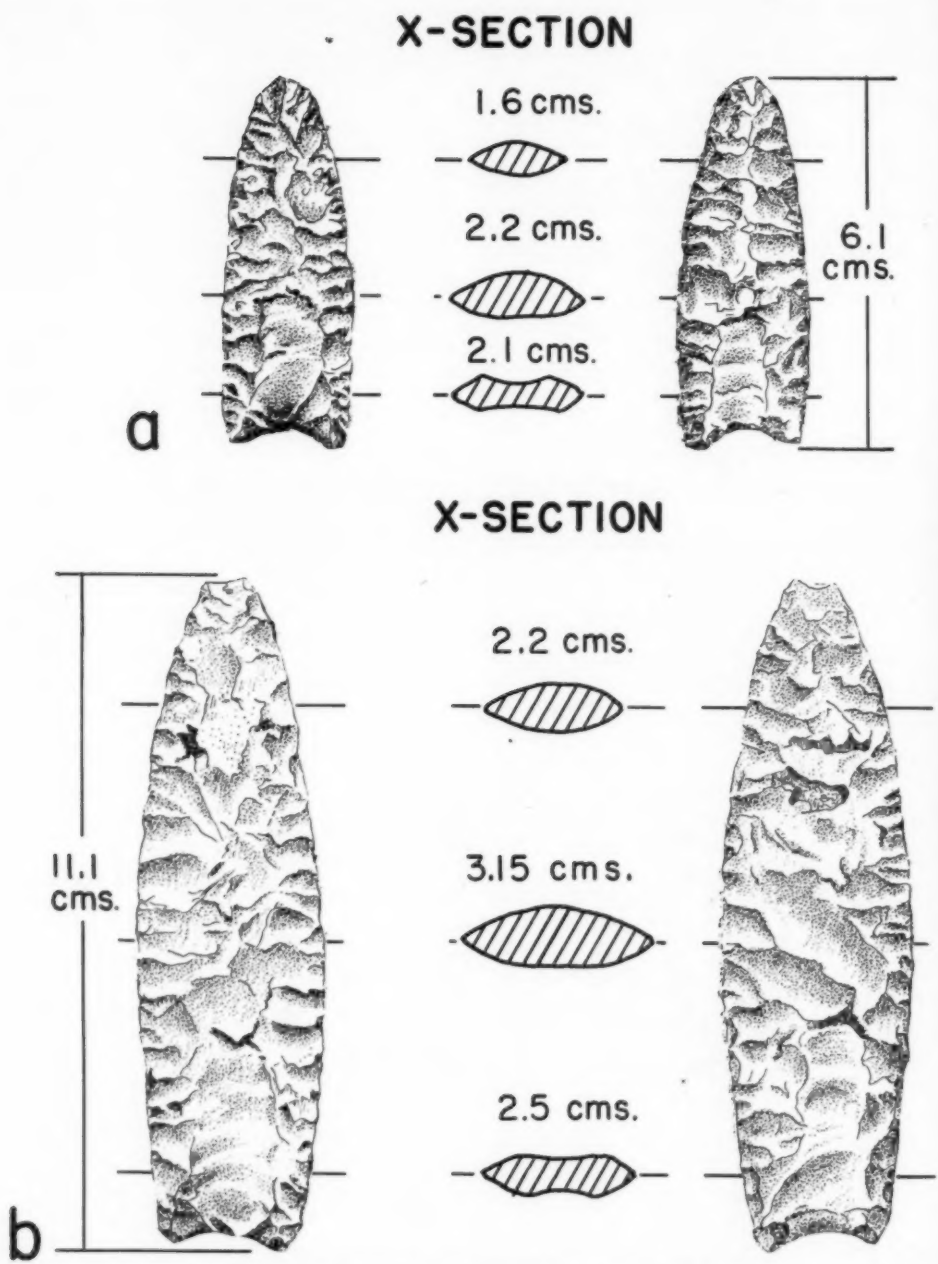

FIG. 31. The shape and cross sections of the fluted points. *a*, the Texas Canyon point; *b*, the Willcox Playa point.

The Texas Canyon point (Fig. 30, *b*; 31, *a*) is a gray colored flint, while the Willcox point (Fig. 30, *a*; 31, *b*) is an ivory colored chalcedony. They are not unlike the flinty texture of the Naco points. The ivory colored piece was identified by Mr. R. Howard of Saint David, Arizona who noted a resemblance of the flint to a deposit of novaculite which outcrops in the Whetstone Mountains near Benson, Arizona.

The flute of the Willcox Playa point (Fig. 30, *a*) measured 3.3 cms. in length and 1.1 cms. in width while the opposite flute measured 3.5 cms. in length and 1.0 cms. in width. The Texas Canyon point (Fig. 30, *b*) measured 2.2 cms. in length and 1.0 cms. in width while the opposite flute measured 2.0 cms. in length and 1.0 cms. in width. From an examination of the chipping it would appear that the Clovis Fluted points from southeastern Arizona were first shaped and then fluted on both sides before they were chipped into a final shape inasmuch as the conchoidal depressions caused by the final chipping were found to overlap the margin of the conchoidal depression of the flute.

Fig. 32. The position of the Willcox Playa point which was lying on a contact surface of stabilized base clay and subsequently covered by dune sand.

The ground edges of the two points were also characteristic of both points. The Willcox point (Fig. 30, *a*) measured from the tang tip down the cutting edge toward the point 3.0 cms. on the left side and 2.8 cms. along the right side. The Texas Canyon point ground edges (Fig. 30, *b*) measured 2.3 cms. on the left edge and 2.5 cms. along the right edge. The span of the tang of the Willcox Playa point (Fig. 30, *a*) measured 1.8 cms. from ear to ear and the concave base was indented .2 cm. while the tang of the Texas Canyon point measured 1.5 cms. from ear to ear and the concave base was indented .3 cm.

In both cases the points were examined for an angle of inclination. It was found that when the base of the points were resting on a level surface they had an angle of inclination of 6¼ degrees from vertical (Fig. 30, *c*).

Figure 31 portrays a scaled drawing of both the Willcox point (Fig. 31, *b*) and the Texas Canyon point (Fig. 31, *a*). In shape the points were closely allied to those found at Naco. The range in size was also found to be comparable. The Texas Canyon point measured 6.1 cms. in length (Fig. 31, *a*) while the Willcox Playa point measured 11.1 cms. in length (Fig. 31, *b*).

The presence of Clovis Fluted points in an area previously designated as the homeland of the Cochise food gatherers lends itself to very interesting speculations. When the Spanish first entered the area of southeastern Arizona they found that the sedentary farmers in the area were surrounded by nomadic hunting groups. This balance of population subsistence was found, also, throughout Sonora, Mexico. It would prove most interesting if one day data were forthcoming from the area to answer the question of whether or not this dual pattern of existence which was represented in the area during initial Spanish contact times had its roots deep in prehistoric times.

In conclusion, I wish to thank Mr. and Mrs. William G. Ferris for their kind cooperation with the Amerind Foundation, Inc., in regards to the reporting of the Willcox Playa point; to Barton K. Wright (Amerind Foundation Staff) for the execution of the drawings accompanying this paper; and R. Howard who kindly identified the materials used in the making of the Clovis Fluted points.

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BOOK REVIEWS

Cultural Stratigraphy in the Viru Valley, Northern Peru: The Formative and Florescent Epochs. WM. DUNCAN STRONG AND CLIFFORD EVANS, JR. Columbia Studies in Archeology and Ethnology, Vol. IV, Columbia University Press, New York, 1952. $8.50.

This volume, dealing with the Formative and Florescent Epochs of north coast Peruvian archaeology, is the third in a series of reports, to be published by various institutions, on the cooperative work of the Viru Valley Project of the Institute of Andean Research. The Viru Valley Project was "an attempt to coordinate various phases of anthropological and allied research around an important central problem — the intensive study of human cultural adaptation within the confines of a small area over a long period of time."

This report deals with that portion of the over-all Viru Valley Project carried on by the Columbia University Unit.

The Columbia University Unit planned "to attack the problem of culture sequence in the Viru Valley through methods of refuse heap stratigraphy." The most promising deposits ran from the Mochica period down into a "hitherto unknown pre-ceramic horizon." It is the work in these cultural horizons — Incipient Agriculture, Formative, and Florescent Epochs, that is described in this volume.

The excavations are described in cultural sequence rather than in the order in which they were made. This is a good arrangement from the reader's point of view, since the development, increasing complexity, and logical growth through epochs is thereby much more readily apparent. Each site excavation is described in detail — the method of procedure, number of excavations and test pits, difficulties encountered, finds, features, stratigraphical cross sections, etc. All the evidence is clearly and carefully presented so that the reader may see not only how the authors arrived at their conclusions, but may also draw differing conclusions of his own if he so desires. At the end of each site report, there are a "Summary of Finds" and a brief "Resume." These sum up the excavation and materials recovered and emphasize the highlights which the authors feel are important.

Indications of a pre-ceramic, but agricultural, horizon were found at the Huaca Negra site near the coast at the mouth of the Viru Valley. Although the results of testing by the Columbia Unit were not detailed enough for definite conclusions on the pre-ceramic occupancy of Huaca Negra, excavations by Bird in both the Viru Valley (at Huaca Negra) and in the Chicama Valley (at Huaca Prieta) revealed a great deal more concerning this culture. Since this particular period was to be studied at greater length by Bird and was outside the immediate province of the investigations of the Columbia Unit, Strong and Evans turned their attention elsewhere.

Having determined the existence of a pre-ceramic agricultural horizon in the Viru Valley, the Columbia Unit proceeded with stratigraphic excavations which revealed, after analysis and comparison with the work of other units, a developing sequence of culture for the valley. Although characteristics of the various periods derived thereby were similar to (and in some aspects identical to) periods known from other valleys in Peru, they were assigned new type names — applicable only to the Viru Valley. In order, from earliest to late, these periods are: Cerro Prieto (pre-ceramic but agricultural); Guañape (Coastal Chavin); Puerto Moorin (Salinar or W/R); Gallinazo; Huancaco (Mochica); Tomaval (North Coast Tiahuanacoid); La Plata (Chimu); Estero (Inca); and finally Colonial. Of these periods the Columbia Unit (and this report) largely concerns itself with only the Guañape, Puerto Moorin, Gallinazo and Huancaco periods — these being the ones which make up the Formative and Florescent Epochs of Peruvian coastal prehistory.

During the Guañape period, either there developed from, or there was superimposed upon, the earlier Cerro Prieto culture a "simple and early manifestation of the Coastal Chavin horizon." There was clear evidence in the strata cuts of pottery developing from a simple undecorated ware to one having "both incised and modeled decoration, a change which was also paralleled by the development and enrichment of other aspects of their culture." Maize cultivation first becomes apparent in this period — at the time of incipient pottery rather than during the earlier agricultural period. Often maize, agriculture and pottery are thought of as being co-equal in space and time, but here in the Viru Valley is clear evidence of at least one case in which an agricultural period was known which had neither maize nor pottery. Although the earliest type of pottery from the coast of Peru is found during the Guanape period, the authors do not, *per se*, feel that these remains represent the beginnings of pottery in Peru. The question of ultimate origins is still an open one.

The excavations of the Columbia Unit did not tie directly to the next and subsequent period, Puerto Moorin, but seemed to represent the early and middle phases of the Guanape period. Collier, however, in another area in the Viru Valley, uncovered pottery types in his lowest strata comparable to those in Strong and Evans' upper strata. Collier's strata continued where the Columbia Unit left off and tied the Guanape material as a whole to the material from the Puerto Moorin period.

Strata cuts at the Gallinazo site made by the Columbia Unit had lower levels containing Puerto Moorin type sherds (which could readily be compared to pottery recovered from their excavations in a cemetery of the same period) while the upper levels contained pottery of the Gallinazo period. This development from Puerto Moorin to Gallinazo was continuous and did not indicate a sharp break, but rather, a gradual development from one period to the next. The earlier Puerto Moorin period was not as well known as the later Gallinazo. This latter seems to have been a long period of expanding development and increasingly complicated technolo-

gies. The extent and time span of the earlier Puerto Moorin period is still not thoroughly understood, though the authors point out that investigations carried on by other units may cast further light upon it.

In addition, excavations in the great Castillo de Tomaval, the most famous site in the Viru Valley, indicated that contrary to the opinion of earlier authorities (who ascribed it to the Mochica), this great structure was most probably built by Gallinazo people and contained "traces of both earlier and later occupations." This conclusion was based not only on pottery types and stratification, but also on a developmental sequence of adobe block types which stratigraphy showed was valid for the Viru Valley. The Puerto Moorin period seems to have been characterized by loaf-shaped adobes, the Gallinazo by rectangular cane mold marked adobes, and the Huancaco by smaller rectangular but unmarked adobes. The Castillo de Tomaval was made of rectangular cane mold marked adobes.

It was during Gallinazo times that negative painted pottery first made its appearance. Through the association of this negative painted ware and some of the more elaborate mortuary vessels, the Gallinazo culture is possibly related to certain earlier cultures in the Callejon de Huaylas.

At the Huaca de la Cruz site, the Columbia Unit carried on excavations in a Gallinazo site that was overlain by Huancaco material. These tests and strata cuts left no doubt as to the relative sequential position of Gallinazo and Huancaco — the former was much the earlier. The Huancaco (or Mochica) manifestations seem to have made their appearance in the Viru Valley rather suddenly and drastically — as though by conquest. Yet the more ordinary, every day life of the people continued as much before, as demonstrated by the continuation of such cultural traits as the plain and utilitarian pottery wares. Even some of the "decorative styles of the Gallinazo culture persisted, blending in some cases with those of the Huancaco conquerers and continuing on even into the next or Tomaval culture period, . . ."

It was in the Gallinazo period that the culture of the Viru Valley reached a high peak or "Florescence" culminating in the short Huancaco period. This is readily apparent from a comparison of the relatively humble fishing, gathering, agricultural but pre-ceramic beginnings in Cerro Prieto times and the complex architectural, religious, social, and material aspects of the Huancaco period. The finding of the remarkable tomb of the "Warrior-Priest," with the possible accompanying human sacrifices and multitudinous artifacts — many of an ornate nature — fully indicates that the people of coastal Peru had reached a high degree of culture long before the Incas made their appearance.

The three final chapters of this report will be of especial interest to all readers. It is here that the authors sum up and correlate much of the previous detailed material and present their views as to how, why, when and from where many of the manifestations apparent in the last period of the Florescent Epoch may have evolved or have been derived. Great care in expressing opinions and drawing conclusions is evident in these sections — no review could possibly do them justice in trying to abridge the already excellent summary of the situation. Many possible ramifications are explored, and tantalizing leads are put forth for further possible investigations. Although this report goes a long way toward helping to clarify much of the over-all picture of Peruvian prehistory during these two long epochs, it also emphasizes the point that there is a great deal of further information still awaiting discovery. Textiles and vegetal remains are studied in the Appendix by Junius Bird and Margaret Towle respectively.

As the authors point out in the second chapter under "Presentation," most readers will be primarily interested in the "brief cultural resumes at the end of each descriptive section and the later comparative and concluding sections." Nonetheless, the authors are to be congratulated on the meticulous and yet interesting manner in which they have presented this material. The description of the discovery and uncovering of the grave of the Warrior-Priest makes excellent, though detailed, reading. The maps and cross sectional drawings scattered through the report are clear, concise, legible and an excellent help in understanding the text. The placing of the detailed descriptions of pottery types in an Appendix facilitates their use for the reader desiring to pursue the subject in great detail. The photographic illustrations at the end are far better than the general half-tones published in most archaeological reports. This report, because of the wealth of material presented and because of the penetrating analysis of the larger aspects of Peruvian culture given in the concluding three sections, is basic for a firm understanding of the present status and future possibilities of this fascinating field.

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Agricultural Origins and Dispersals. CARL O. SAUER. American Geographical Society. New York. 1952. 110 pp. $4.00.

This little treatise represents, in published form, the second series of lectures sponsored by the Isaiah Bowman Memorial Fund. The author, a geographer, defines his task as interpreting the meeting of natural history and cultural history. He begins with the premise that in the history of mankind the diffusion of ideas from a few hearths has been the rule, and independent parallel invention the exception. He concedes that agriculture was probably invented first in the Old World and accepts the dating of the earliest archaeological evidence of agriculture in the Near East at 7000 to 8000 years. But he contends that these earliest Neolithic farmers were far removed in time and place from the origins of agriculture, which may well have begun "several times seven thousand" years ago among people living in wooded lands in a tropical climate. The founders of agriculture were sedentary, well-situated fishing folk

living along fresh waters. Fishing provided a stable and year-around food supply as well as leisure, and it was leisure, not necessity, which mothered the invention of agriculture. The waterways provided lines of communication for dispersing the art of agriculture, once invented, to other parts of the world.

As the cradle of earliest agriculture Sauer postulates Southeastern Asia. No other area is so well furnished, he believes, for the rise of a fishing-farming culture and none is so well located at the hub of the Old World for communication by land or water.

It is assumed that agriculture began with the planting of vegetatively-reproduced species, and that the growing of plants from seed is a more recent development. Among the cultigens thought to be indigenous to the cradle of agriculture are bananas and plantains, ginger, yams, sago palm, varieties of pandanus, bamboos, sugar cane, breadfruit, citrus fruits, persimmons and derris, the last a leguminous plant cultivated as a fish poison. It is suggested that the use of fish poisons preceded agriculture and was perhaps a forerunner of it. It is suggested, further, that the use of fish poisons was discovered as a consequence of extracting fibers or bark cloth from plants by maceration. Rice and coconuts, which are grown from seed, are assumed to have been more recent additions to the list of cultigens in this region.

In addition to the cultivated plants there were also brought under domestication, primarily as household pets, the dog, pig, fowl, duck and goose. Domestication of both plants and animals was the work of woman. The idea that the dog, a hunting animal, became domesticated by joining man in his hunts is regarded as romantic; the use of dogs for hunting is said to be a late specialization among people of advanced cultures.

This ancient complex of cultivated plants and household animals was dispersed far and wide in all directions except northward where cold blocked the way. The dogs of Australia and the wild pigs of Timor and New Guinea are feral remnants of this dispersal. Rice, bamboos, bananas, taros, persimmons and yams were carried into China after first being remade by man in East Asia. The dog, fowl, bananas and taros were carried into Africa, not by way of the Fertile Crescent, but directly through the Abyssinian Highland and its foothills.

The Near East and Mediterranean regions are no more than recent peripheral developments of the dispersal from the original hearth in Southeast Asia. The plants of the Old Planter culture failed to reach the northern periphery; only the dog and the pig succeeded in doing this. The culture of olives is, however, thought to resemble the disciplined planting art of India and accounts for the fact that in one corner of the Mediterranean — that facing the ancient East — we find the origin of cultigens shaped according to the eastern model.

The art of seeding is assumed to be relatively recent in the Old World and marginal to the art of planting. Three centers of seed domestication, North China, Ethiopia and the Near East, all marginal to Old Planter lands, are postulated, although the third turns out, on close examination, to be a salient rather than a center and to comprise three areas extending from Central India to the Mediterranean. In each of these "centers" the climate rendered vegetative production difficult and facilitated seeding. Consequently each center developed cultivated cereal grasses, legumes as sources of proteins and fats, and usually an oil or fiber plant. The Chinese and Ethiopian centers are regarded as older than the central salient, and in the latter the Near East is regarded as later than the two sides of the Indus.

The history of agriculture in the New World parallels closely that of the Old. Here a hearth of tropical planters occurred in northwestern South America. Here people who resembled the Indonesians in a number of ethnic traits, including cannabalism, dog-eating, body-painting, fish-netting, superb boatmanship, and the use of fish poisons, began agriculture with a group of vegetatively-propagated plants including manihot, sweet potato, arracacha, native yams and Xanthosoma, the last an American counterpart of the Old World taro. The starchy diet derived from these plants was supplemented, as it was in Southeast Asia, by proteins and fats from fish and a variety of aquatic and waterside animals. The only animal domesticated in this hearth was the Muscovy duck.

From this hearth the pattern of vegetative planting was carried as far south as Chiloe, and several starchy root crops including oca, ulluco, añu and the potato were added to the complex. Northward, however, the complex spread no further than Central America; beyond this the art of planting gave way to that of seeding.

The planting culture of the New World was probably initially indigenous, although it resembled that of Southeast Asia in many traits and was undoubtedly enriched at times by contacts from across the Pacific. Crossings are assumed to have been made in both directions. From the west to the east came diploid cotton, the gourd, Canavalia beans, the coconut, plantains, the chicken, the corn-mother myth, the use of masticatories with lime, the blowgun, dog-eating, and chicha fermentation by chewing. From east to west traveled the cultivated cucurbits, tetraploid cotton and the grain amaranths. Where maize originated and in which direction it was dispersed in pre-Columbian times is still a matter of speculation, although there is no doubt that the corn-mother myth came from the Old World to the New.

In the foreword the author is quoted as stating that "He does not try to give a well-polished abstract of accepted learning, as much as a prospectus of that which is not securely within our grasp." Yet his conclusions are bold and sweeping and amount, essentially, to a broad new theory of the early history of mankind, a theory presented in a consistently readable and often eloquent style imparting to it an aura of substance and plausibility which it scarcely deserves. Again and again this reviewer found it difficult to believe that statements presented so clearly and so confidently should contain, when carefully examined, so little fact. The theory is

based not upon evidence but upon a lack of it. The author has indeed made a careful "prospectus of that which is not securely within our grasp" and upon this insubstantial foundation has erected a far-reaching theory.

It is impossible in this review to analyze all of the remarkable conclusions contained in the book but comment on several typical examples may be useful. At least so far as plants are concerned there is no evidence of early agricultural hearths in either Southeast Asia or northwestern South America. The former may well be the center of ancient cultigens but it is only one of eight centers recognized by Vavilov. It is by no means the richest center nor is there any evidence that its cultigens are extraordinarily ancient. Southeast Asia may well be, as Sauer (following Vavilov) postulates, the home of a number of carbohydrate-furnishing food plants, but this does not make it the cradle of Old World agriculture. The coconut probably also originated in this area, but there is no evidence that its culture, because it is sexually reproduced, came only after the art of planting was well established. Actually the culture of the coconut, because of its large seeds, is more akin to planting than to seeding and Douglas Oliver tells me that the similarity is recognized even today by many Oceanic peoples who plant coconuts, along with other vegetatively-propagated plants, but in other respects have little conception of the art of seeding. There is no evidence whatever that rice is more recent than other Asiatic cultigens; on the contrary, if the number of distinct varieties is a criterion, rice is one of the most ancient.

There is no evidence that the use of fish poisons is a forerunner of agriculture (although in some parts of the world it undoubtedly preceded it) or that it is a consequence of the still earlier art of macerating or retting plants in water for their fibers or bark cloths. The most potent fish poisons — those most likely to have been first discovered — are derived from species of leguminous plants which are of little use for fiber and which furnish no bark cloths. Furthermore, in these plants the fish-stunning substance, rotenone, occurs in the roots while the fibers, if any, are obtained from the stem.

The evidence of routes of dispersal from the hearths is almost wholly nonexistent and the delineation of the routes themselves involves assumptions for which there is little basis either in geography or history. There is no evidence, for example, that the Chinese and Abyssinian centers of seeding are older than the Near Eastern center. Indeed, there is no evidence that the art of seeding is marginal and was adopted because the limits of areas suitable for planting had been reached. It seems more reasonable to suppose that planting was practiced in regions, mainly tropical, where the cultigens were derived from native, herbaceous perennial plants suitable for vegetative reproduction, and that seeding was practiced in other regions, mainly temperate or subtropical, where the cultigens originated from indigenous annual plants easily propagated by seed.

In the New World two of the principal cultigens with which agriculture is assumed to have begun, manihot and the sweet potato, are almost certainly not indigenous to the hearth (as it is delineated on the map) and were introduced from elsewhere. Does this suggest the existence of still earlier "pre-hearths?"

The evidence for trans-Pacific carriage is thin and fragmentary and does not add up to the picture of repeated cultural interchanges which is implied. It is now generally conceded that the sweet potato reached Polynesia several centuries before the discovery of America and that there may have been a few colonies of coconuts on the Pacific shores of America when the Spaniards arrived. There is no doubt that the gourd occurred in both the Old World and the New in prehistoric times. But both the coconut and the gourd are "drift" fruits designed by nature to be dispersed by water, and there is no tangible evidence that they were carried across the Pacific by man. The evidence on cotton, plantains, the chicken, the cucurbits and amaranths is either completely lacking or consists of nothing more than untestable hypotheses based on speculation. The Canavalia beans of the Old World and the New are now recognized as different species; whatever evidence they once provided was based an faulty botanical nomenclature. The reader may draw his own conclusions about the significance of cannibalism, dog-eating, body-painting, fish-netting and superb boatmanship in the two areas.

So much for specific examples; Sauer's basic premise — that diffusion of ideas has been the rule and widespread parallel invention the exception — also lacks substantial foundation. The old argument between diffusion and independent invention is not likely to be resolved either by this book or by any review of it. Indeed the argument itself is essentially futile since there is no doubt that both diffusion and independent invention occur and that both have played a part in man's cultural history. To ask which has been most important is like asking which link is most important in a chain. Certainly to say that one has been the rule and the other the exception not only goes directly against the evidence but also against the principles of evolution. The biologist who recognizes evolution as "the product of a sequence of highly improbable events" expects to encounter in cultural evolution, as in organic evolution, frequent examples of parallel development, and he is not disappointed. Independent parallel invention is a well-recognized phenomenon in modern societies, and there is no evidence that ancient man was inherently less intelligent than his modern counterpart. Familiar to most readers are the invention in prehistoric times, in both the Old World and the New, of arithmetic, including the decimal system, astronomy and calendars. The art of writing, called by Huntington "man's supreme achievement" was invented separately in four parts of the world. Less familiar are examples of the independent development of various uses of plants. I should like to mention three: caffeine-containing plants, arrow poisons and fish poisons.

Caffeine is a weak alkaloid for which man has no physiological necessity, but which he has learned to consume for the sense of well-being which it imparts to him some time after its consumption. Caffeine, although slightly bitter, has no other characteristic flavor or odor by which it can be positively identified. Yet man in nearly all parts of the world except Southeast Asia has screened the plants in his region and has identified those which contain caffeine or the closely-related substance theobromine. In six plant families he has discovered nine distinct species in nine parts of the world which contain caffeine (or theobromine) in sufficient amounts to be useful. And, by prolonged trial and error, he has found that part of the plant which contains the most alkaloid in palatable form: the leaves of tea, khat, cassine and mate; the seeds of coffee, cola, cacao and guaraná; and the bark of yoco. Can this complex situation be explained in terms of diffusion of one idea — the use of caffeine — and if so, what hearth gave rise to it and what routes of dispersal could possibly have resulted in its pattern of distribution?

The story of arrow poisons is almost equally complex. There is, it is true, a rather striking similarity between the use of arrow poisons in parts of Asia and South America. But it is difficult to prove that this has any real significance since there are different kinds of similarities between other regions. Arrow poisons have been used in almost all parts of the world — Africa, Asia, North and South America — and in America alone have involved at least 21 different plant families. At least 52 species of plants have been involved in the preparation of the South American arrow poison, curare. The number of ways of preparing arrow poisons is large, but is by no means infinite. It is almost inevitable that some similarities in their use would evolve in different parts of the world, especially when it is recognized that substances from which arrow poisons are prepared are sometimes quite similar, although the plants from which they are derived may be very different.

The similarities in the use of fish poisons in different regions of the world are especially impressive. Innumerable species of plants have been used, some for their saponins, others for their alkaloids. The use of rotenone-containing plants of the family Leguminosae, particularly of the genera Derris, Lonchocarpus and Tephrosia, is especially striking. In each genus several different species have been used. In the case of Tephrosia four different species, *T. astragaloides*, *T. vogelii*, *T. toxicaria*, and *T. virginiana*, indigenous to Australia, Africa, South and North America, respectively, have been employed. Primitive man has done such a thorough job of discovering the rotenone-containing plants of the world that entomologists, searching for new sources of rotenone for insecticides, began their survey with plants known to have been used in various parts of the world as fish poisons. If this is a case of diffusion where did the practice originate, what are the routes of dispersal, and what manner of "tribal memory" kept the trait alive while man lived in areas where Tephrosia does not occur?

If, in considering the invention and dispersal of agriculture, one must begin with a single basic premise (a questionable procedure), it would seem to this reviewer to be safer and more in keeping with the evidence to assume that man in all parts of the world, possessed of the same or similar needs and desires as well as of an insatiable curiosity, has experimented endlessly with all of the plants which surround him. When the same family, genus or species of plants occurs in different parts of the world (and the dispersal of plants over the globe, which is measured in millions and tens of millions of years, is much more ancient than the dispersal of man), it is almost inevitable that man would have found similar uses for similar plants in response to similar needs. Cultural similarities in the uses of plants are often nothing more than the consequences of plant geography, a fact which the author, for a geographer, seems strangely reluctant to take into full consideration.

To recognize the remarkable ability of primitive man as an empirical chemist in discovering sources of caffeine, rotenone and other alkaloids in different species, genera and families of plants, or to credit him (as Sauer does) with remarkably effective techniques of plant improvement still unknown to modern geneticists, and at the same time to deny the widespread existence of inventiveness, seems to this reviewer to produce a distorted picture, decidedly lacking not only in historical perspective, but also in an appreciation of man's inherent intelligence, curiosity and ingenuity.

A theory almost completely lacking in factual basis may still be stimulating and provocative and may be especially useful if it can be subjected to critical tests which would prove it wrong. I can think of no such tests to apply to Sauer's theory. His two principal hearths occur in regions where few archaeological remains have so far been found and where the climate almost precludes the long-time preservation of herbaceous cultigens. Practically all of his conclusions, although unsupported by evidence, are still virtually impossible to disprove. Indeed if one sought, as an exercise in imagination, to design a completely untestable theory of agricultural origins and dispersals, it would be difficult to improve upon this one. In creating such a theory, the author has at least demonstrated that there are still huge gaps in our knowledge of man's history.

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The Grain Amaranths: a Survey of their History and Classification. JONATHAN DEININGER SAUER. Annals of the Missouri Botanical Garden, Vol. 37, 1950, pp. 561-632, plates 10-14.

At the time of the discovery of the Americas, the Indians had in cultivation somewhere near a hundred kinds of domesticated plants. Some of these, such as maize, white potato, sweet potato, tomato, peanut, and various beans and pumpkins, have been adopted into commerce and are well known. Many others have re-

mained in folk agriculture and still are virtually unknown to Western civilization. The grain amaranth group treated by Sauer is an excellent example of this latter category. In spite of its apparent former importance and seeming respectable antiquity, this group has received little attention from either botanists or anthropologists.

The genus *Amaranthus* (family Amaranthaceae) is an exceedingly widespread one of many species occurring in the tropics and temperate regions of both the Eastern and Western hemispheres. The herbaceous plants of this genus are usually low-growing but may be lush plants higher than the head of a man. They are often aggressive weeds which take over disturbed areas and therefore follow man. Various species, either wild, semicultivated, or cultivated, have been of economic significance chiefly among primitive peoples as potherbs, food coloring agents, as grains for their starch, in magic and ceremony, and as ornamentals. Forms perhaps familiar to North Americans are the Love-Lies-Bleeding and Prince's Feather of our flower gardens.

Sauer's investigations of this important but relatively obscure group were carried out as a part of a doctoral problem at Washington University under the direction of Edgar Anderson. In the paper under review he confines himself to a discussion of the species cultivated for their seeds. An earlier short paper dealt with the dye amaranths of the Peublo area of the Southwest (Southwestern Journal of Anthropology, Vol. 6, 1950, 412-15). Publication of data on uncultivated economic species is anticipated for the future. The paper is not presented as a conventional botanical "monograph" of the genus, but rather as a survey of geographical distribution, cultural association, the forms cultivated, and their economic and historical importance.

The data were drawn primarily from ethnography, travel accounts, and botanical sources. Archaeology as such was not included, as it had almost nothing to offer, but the paper has important implications for culture history. Sauer utilized a large amount of often obscure documentary materials (about 150 bibliographical items), and examined some 500 botanical specimens from various herbariums. This large task resulted in the reduction of a jumble of aboriginal names and scientific terms to some order, and the resolving of considerable taxonomic confusion. From a welter of previously named forms he emerges with only four species of cultivated grain amaranths. The materials are handled objectively and the report is clearly and concisely written.

Sauer's findings in essence are that in the Americas there were four essentially distinct centers of cultivation, each with its own separate species: 1) Mexico into the southwestern United States (*A. leucocarpus*), 2) Guatemala (*A. cruentus*), 3) Andean region (*A. caudatus*), 4) Argentina (*A. edulis*). Two of these species, those from Mexico and the Andean region, are also cultivated in Asia throughout a large area extending from Manchuria through interior China and the Himalayas to India, Afghanistan, and Iran. Records for Africa are feeble, but there is some indication that *A. caudatus* may have been present to a limited extent in the warmer regions.

Wherever the grain amaranths appear in cultivation today, they are secondary or marginal crops which apparently have been submerged by or pushed to the peripheries by larger seeded grain crops such as maize or rice. In Asia, they are largely in the hands of scattered hill peoples and there are no surviving records of their use by the more advanced peoples of the coasts. In America also, they are distinctly secondary and usually in isolated upland areas. From this pattern, Sauer infers that the amaranths were of ancient cultivation and of formerly greater economic importance, but now are a disappearing relic. Arguments to support this viewpoint are found in their wide but scattered distribution, persistence among retarded marginal peoples, and in their ceremonial association and veneration. Sauer discusses these points at some length particularly for the Mexican area, citing early historic tribute records and impressive ceremonial contexts.

If the grain amaranths have been displaced by larger seeded grains, then a chronological priority of the grain amaranths is implied. Sauer contends that a long association of the amaranths with man is indicated by the wide-spread use of the seeds by gathering peoples. A point not stressed by him is that the amaranths are almost ideal plants for seed gathering, particularly with gathering basket and seed beater. They produce a prodigious number of seeds concentrated in compact terminal position and at convenient height. The seeds fall readily at maturity. There is hardly a plant which would yield a greater amount of food in a short time. For temperate North America, at least, there is certainly abundant documentation of the gathering of seeds of wild amaranths. If there is any validity in the theory that the popping qualities of starchy seeds led to their early use and domestication, then again the amaranths can qualify.

From my own experience with North American materials, I can vouch that amaranth seeds are one of the more common kinds found in archaeological sites. They probably have occurred much more often than they have been saved, as the seeds are small and inconspicuous (about 1 mm. in diameter). They will pass through screens normally used and likely would not be noticed unless in caches or containers. All of the archaeological amaranth seeds which I have handled fall within the normal size range for seeds of wild plants and none by their size have obtruded themselves as necessarily cultivated. Some are from non-agricultural sites and levels.

Sauer points out, however, that cultivation has affected the quantity of seeds produced per plant, but has had little effect on the size of the seeds. He presents rather convincing evidence that the yield of grain amaranths per unit of land may be greater than that of corn. But the seeds are tiny and more difficult to handle and process. It might well have been that the amaranths could compete with earlier undeveloped forms of maize and rice, but eventually lost out as these crops were improved.

Sauer considers that all evidence points to an American origin for all four of the cultivated species of grain amaranths. This opinion is based largely on the greater botanical diversity of the amaranths in the Americas, the closer relationships of cultivated forms to wild forms here, and the more developed use of wild plants for grain purposes here. As two of the species (those typical of the Mexican and Andean centers) also appear in cultivation in Asia, transfer from America is indicated. Not only are the plants apparently identical, but also a complex of traits involving methods of cultivation, preparation, and use. The most common method of utilization was popping of the seeds and adding syrup as a binder to form cakes. This specific process occurs in such widely separated areas as China, Mexico, Nepal, and Argentina.

One cannot dodge the issue here by suggesting the floating of seeds, as this seems biologically impossible, and further, complexes do not float unattended by man. Sauer suggests that a movement of the grain amaranths from America to Asia in pre-Columbian times is indicated. He is exceedingly restrained and objective in his statements and does not push this interpretation. He does not construct land bridges or invoke Alexander's fleet, but modestly states his arguments and lets them stand on their own merits. He admits freely the possibility of post-Columbian transfer.

Sauer in stating his case for early transfer translates such factors as marginality, ingrained nature of the pattern, and ceremonial associations into chronological depth. I do not venture to refute him, but I do wish to submit that using a similar approach it can be argued that wheat was introduced into the Pueblo area of the Southwest in pre-Columbian times. These retarded "hill" peoples of the Southwest have archaic relic forms of wheat which are not found among more advanced lowland peoples of the coasts. They have a complex of very primitive methods of cultivation and processing, including threshing by trampling with horses, which are found only in marginal parts of the Old World or in earlier periods there. Wheat is considered by some of the Pueblos to be an ancient crop and there is no recollection of its introduction. Wheat among some of the Pueblos has ceremonial associations and is mentioned in origin myths as one of the original crops received from the gods at the beginning of the world. Yet in spite of these indications of great antiquity, we have clear evidence of the introduction of wheat by the Spaniards approximately 350 years ago.

Until recent years it was axiomatic in American anthropology that the cultural developments of the Old World and New World were independent and that any influences between the hemispheres were only by deculturizing northern routes. Almost the heart of the argument for this view was the essentially distinct inventory of crop plants and field methods in agriculture. It was recognized that the gourd and cotton did not quite conform, but there was a feeling that if we did not notice these problems they might go away. They are still with us, and recruits have been added in such crops as the sweet potato, corn, coconut, and we can now add the grain amaranths. These recalcitrant domesticates and perhaps others, refuse to remain neatly compartmentalized in one hemisphere or the other.

Loaded dice were used in the arguments for the distinctiveness of the American agricultural pattern from that of the Old World. Comparisons were always made to the Mediterranean pattern of seed cultivation with the plow and draft animals. Comparisons of American agriculture were not made to that of southeast Asia, where slash and burn clearing, root crop cultivation, and hand tools and methods were characteristic. The southeast Asian pattern and the American one appear to have more in common than either has with the Mediterranean complex. The fact that claims of transoceanic transfer almost always point to southeast Asia begins to gain significance.

The plant data continue to pile up suggestions of extensive contact across the Pacific in both directions. If these influences were in pre-Columbian times as seems increasingly indicated, a quandary exists in that anthropology cannot yet furnish appropriate human agencies to have affected the transfer. Cultural similarities are appearing, but these are chiefly in parallel items and not in broad patterns which can be pinned down precisely in time and to specific places. Certainly the information from archaeology, ethnography, and linguistics as presently construed is unable to support the burden imposed by the more exuberant interpretations of transfer of plants by human agency in remote times.

It is apparent that there is simply a lack of sufficient clearcut data to give answers to the questions which have arisen. In lieu of adequate data, one can take his stand either "for" or "against" trans-Pacific contact and defend his position by citing selected "authoritative" sources. But the problems involved are of considerable import to anthropology and to botany and deserve the best scholarly efforts which can be expended. In the meantime, little can be gained and much can be lost by acrimonious argument and character defamation. Bloody rearguard action and last ditch defense of fixed positions will avail nothing except perhaps the temporary salvaging of personal reputations. What is needed instead is a campaign of fluid maneuver with the perfection of present weapons and the development of new ones.

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American Indians in the Pacific, The Theory behind the Kon-Tiki Expedition. THOR HEYERDAHL. George Allen & Unwin Ltd., London, 1952. xiv+821 pp., 90 plates, 11 maps.

The thesis of Mr. Heyerdahl's 763 large pages of text is that the physical stock and culture of Polynesia are derived principally from the Americas. Much of the nation is already familiar with this general theory from the author's activities of the past several years. In this work, however, he presents particulars, which the reader may glean only after reading hundreds of pages.

A brief and perhaps, because of its brevity, inadequate statement of the author's theories, in his own order of presentation, is as follows: Kwakiutl Indians ("Caucasian-like" with a touch of Mongoloid characteristics), driven from the Northwest Coast by invading Bella Coola, reached the island of Hawaii in large boats sometime before the traditional great period of Polynesian migration of the 13th and 14th centuries. Upon arrival in Hawaii the Kwakiutl found peoples much like themselves, i.e., Caucasoid, already established. A mingling of these peoples through time produced "the dominant type of modern islander," who is called, for "convenience," Maori-Polynesian. The island of Hawaii, largely by reinterpretation of Polynesian mythology, becomes identified as Hawaiiki, the legendary Polynesian homeland. The traditional migrations and colonizations of the 13th and 14th centuries were thus from Hawaii. Knowledge of the existence and location of the islands outside the Hawaiian group was already known among the earlier settlers, who had spread through Polynesia from the east. The provenience of these earlier and first occupants of Polynesia, was Peru, chiefly Tiahuanaco Peru. Riding on balsa rafts and taking advantage of the prevailing ocean currents, these Peruvian Caucasoids had early reached Easter Island and spread on throughout Polynesia. It should be added here that the author interprets most of the domesticated plants and animals of Polynesia as coming from Melanesia, received by barter. He also acknowledges the presence of slight negroid elements in the Polynesian physical makeup.

To support these theories the author first makes an attack upon hypotheses of migrations of peoples from Asia or Indonesia through Melanesia or Micronesia. Having disposed of the possibility of a populating of Polynesia from the west, he searches for "intelligent" and Caucasoid peoples in the New World, and finds them in Peru and among the Kwakiutl. The negroid traits among Polynesians are accounted for by Melanesians, transported from Melanesia as slaves or laborers by the predominantly Caucasoid Polynesians. This is an idea which, when first introduced, is described as being possibly "fantastic" to some readers. It soon appears to become solid fact to the author, and the negroid elements in Polynesia seem to become progressively minute in quantity as the pages of this work increase in number.

In finding a Caucasoid group in Peru heavy reliance is placed upon traditional tales (called, with distressing frequency, "memories") of early fair peoples and bearded, light-skinned culture heroes, upon light-haired mummies, and upon depictions of fair, bearded and acquiline-nosed men on pottery vessels, in stone statuary and in murals. Central America is included in the search for Caucasoid traits. Polynesian-like and Caucasoid physical traits (and "mental traits") among the Kwakiutl are also explored, with a conclusion satisfactory to the author.

The bulk of the work is devoted to finding similarities in physical type and culture between Polynesia and the American areas in question. A vast amount of material including many photographs is presented. Of the photographs, it may be noted that those comparing Northwest Coast and Polynesian physical types appear to weaken rather than buttress Heyerdahl's thesis.

Numerous objections may be made to this work. The treatment throughout is opportunistic. Every straw is seized, bent and twisted to suit the author's purposes. Tenuous evidence is pushed beyond reasonable limits; conflicting data are given scant attention or omitted, and the manuscript abounds with incautious statements. The author is both ingenious and ingenuous, and verbal magic is a recurrently used tool. Even the reader who, like this reviewer, is only modestly informed on the areas concerned may find many hundreds of points which he will question or reject. It will be difficult for many persons to avoid reading racism from this work. Numerous other objections may also be made.

Perhaps the most serious defect is that the manner of presentation, the omissions, and the indiscriminate use of supporting data will so irritate and alienate professionals among the readers of this book that the contributions it makes will go unnoticed or unappreciated. It may be difficult for many to accept any part of a work in which, to cite but one small example, reasoning of the following sort is employed: The author regards it as most improbable that hypothetical migrants from Indonesia or Asia would lose such crafts as pottery-making and weaving. This appears to be a reasonable enough stand. With an hypothesis of the populating of Polynesia from Peru, however, the author's position is reversed and "stagnation and retrogression" become "natural" in an island environment.

In more mechanical matters, it may be said that this work is poorly organized and extremely repetitious. One gets the impression that a mass of notes or the rough draft of a manuscript somehow or another got published. There are, curiously, even an unusual number of typographical errors. These are all, however, relatively minor matters, and it is possible that the author labored under something of a language difficulty.

The foregoing remarks go further in indictment of this work than the over-all reaction of this reviewer warrants. Mr. Heyerdahl, as he states in this book, has been the recipient of a number of unsympathetic remarks in the past. He will again with the reception of this work. The cause will lie not so much in lack of sympathy with his views or at least some of his views, but simply in antipathy toward his use and manner of presentation of data. There has been a strong interest for some years in the problems and questions with which Heyerdahl deals, and he himself has no doubt stimulated at least a part of that interest. Perhaps the most profitable course is to view the author as a man of both zeal and dedication, and utilize some of the products of his zeal. This volume amasses under one cover a great deal of useful material among the slag, and the author presents points of view and raises questions which merit serious attention. At the very least this work may serve as a useful compendium of data concerning trans-Pacific contacts.

It would be desirable if the author, who is apparently capable of doing imposing quantities of work, would direct some of his energies toward investigation of other and *all* areas of the Pacific. His treatment of the western Pacific is, as a whole, both slight and slighting. It strikes the reviewer that an impressive case of similarity along *some* lines can be and has been built even between Japan and Polynesia. Certainly the turn-of-the-century linguists who sought to classify Japanese as a Malayo-Polynesian language present a case which, although far from convincing, is better than that of Heyerdahl for New World-Polynesian linguistic affinities. The foregoing is not to say that the reviewer advocates Japan as the Polynesian homeland or vice versa. It is to say that in dealing with the question at hand it is essential to consider all areas of the Pacific.

It is a common pratice in reviews of works which controvert prevailing theory to throw the author a consolatory bone by saying that his work stimulates reexamination of the problems and theories in question. I do not think the author's theories are so violently in opposition to general anthropological opinion as he appears to believe, and I wish to do more than throw him such a bone. Finally, I view this work as a contribution and wish its author good speed in his present venture in the Galapagos Islands.

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The Spiro Mound. HENRY W. HAMILTON and others, The Missouri Archaeologist, Volume 14, October, 1952, Columbia, Missouri, $3.00.

This publication presents welcome data and information concerning the famous Spiro burial mound of eastern Oklahoma. As Griffin states, "The Spiro site is regarded as one of the highest importance in the Caddoan area. It contained one of the most concentrated deposits of ceremonial material ever uncovered in the United States." A glance through the extensive illustrations which make up more than one-half of the report adequately supports this statement.

The volume contains a total of 276 pages of which 151 are full page plates of illustrations. The content includes a short preface by James B. Griffin in which he comments upon the publication difficulties and the value of non-professional contributions to archaeology. This is followed by three sections: (1) "The Spiro Mound," by Henry W. Hamilton; (2) "An Interpretation of the Place of Spiro in Southeastern Archaeology," by James B. Griffin; and (3) "Textile Fabrics from the Spiro Mound," by Charles C. Willoughby. A brief bibliography and the illustrations complete the report. The volume was edited by Carl H. Chapman for the Missouri Archaeological Society, and this society is to be commended for undertaking the responsibility of publication.

Mr. Hamilton's section on the Spiro mound represents the major portion of the report. This has been written for some years, awaiting final publication, and has been known to numerous archaeologists as the "Hamilton manuscript." During the period from 1933 to 1935 when the Spiro mound was being looted by commercial diggers, Hamilton became interested in the site and the many spectacular artifacts which were being found. Since no one was apparently collecting data about the finds, he set out to gather all the information he could; he made an effort particularly to obtain photographs or drawings of artifacts found at the mound. He gathered pictures and information from collectors scattered in all sections of the country, from relic dealers who had handled the Spiro material, from the commercial diggers themselves, and from various individuals who had observed activities at the site.

These data are presented for what they are worth. Since this account together with that of Burnett (1945) and Clements (1945) represents the only reliable information concerning the commercial digging at the site, the report is invaluable.

Hamilton presents information as to how he collected his data, a general description of the site, comments concerning the excavations and the "central chamber," and a description of the various artifacts. The artifacts are grouped into categories such as Animal Effigy Pipes of Stone, Bone Artifacts, Pottery Vessels, Chipped Stone Maces, etc. Specimens are described and illustrated in the plates and reference to similar discoveries elsewhere in the United States is frequent. His section on engraved shell is the most extensive, and probably the most important, from the standpoint of reconstructing Spiro cultural activities. Hamilton has also attempted to estimate the relative quantity of artifacts found at the site by the diggers, and the suggested list is most impressive. Even so, there is little doubt that his listing is quite conservative.

The section by James B. Griffin is essentially what the title implies: "An Interpretation of the Place of Spiro in Southeastern Archaeology." This was prepared originally in 1949 but was modified in 1950. In this Griffin discusses most of the artifacts illustrated and comments upon the archaeological context within which such specimens usually occur. He concludes that the Spiro materials are to be aligned with those of Middle Mississippian sites to the east rather than earlier horizons such as Hopewell, and although it is an important local development, the basic stimulus for its florescence came from the Southeast.

The concluding portion by Charles C. Willoughby presents an analysis of various textile fabrics from the Spiro mound. This has been based upon a study of specimens in the Peabody Museum at Harvard and the Harry M. Trowbridge collection at Bethel, Kansas. He surveys the types of fabrics represented, the fibers used and the manufacturing techniques represented.

In view of the many tales, rumors and Sunday supplement stories concerning the commercial diggers' discoveries at the Spiro mound, Hamilton's collection and critical evaluation of this material is most welcome. It

would be practically impossible to assemble such data today, and although many questions remain, this will probably stand as the essentially correct information concerning the commercial activities at the site.

A number of the plates figured by Hamilton have already been published in the volume by Burnett (1945); however, many are presented here for the first time. It is certainly true that this report does not include all of the materials found at the site by the commercial diggers; there are undoubtedly many other objects which have been unavailable to Hamilton for one reason or another. Nevertheless, his survey does include the great majority of the specimens known to have been found during this period of activity at the site, and it is doubtful if further search would materially alter the general picture presented.

The reader familiar with the Clements report (1945) will realize that Hamilton does not support Clements' ideas concerning the interior construction of the Spiro mound. Clements doubted the existence of an interior chamber within the large conical portion of the mound, whereas Hamilton believes that such a chamber did actually exist. If forced to take sides on this issue, I would agree with Hamilton in the opinion that some sort of a central chamber did exist within the mound. The matter of a tunnel running along the main axis of the mound has been properly debunked by Clements, and it is not mentioned by Hamilton. There is no evidence to support the presence of this tunnel as far as I know.

The section by Griffin greatly increases the value of the report by offering a professional opinion about the significance of the materials. It seems clear that all of the Spiro specimens do not represent a single time period.

The chief value of the Spiro mound report appears to rest in the listing of the various artifacts and characteristics which were represented at the site. Since a number of these traits were not recovered by the later University of Oklahoma excavations, it helps to give a fuller understanding of the cultural characteristics of the site. What remains to be done, of course, is the publication of a detailed report about the site which presents data obtained by the University of Oklahoma's excavations after the pot hunters had abandoned their work.

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Middle American Research Records, Vol. I, Nos. 1-16. ROBERT WAUCHOPE editor, Publication 15, Middle American Research Institute, Tulane University of Louisiana, New Orleans, 1951, 280 pages.

Publication number 15 of the Middle American Research Institute of Tulane University, edited under the able guidance of Robert Wauchope, represents work published in the Middle American field during the years 1942 to 1950. The sixteen articles in this volume can be grouped as follows: nine in archaeology, two in physical anthropology, two in ethnology, one in applied anthropology, one in social anthropology, and one is a chemical analysis of Salvadoranean clays (No. 5). These articles all appeared at irregular intervals as Middle American Research Records and were distributed immediately upon being written. In this way the relatively inexpensive method of lithoprinting made it possible for students of the Middle American field to keep abreast of the latest studies without the long delay that is usually necessary for the printing of anthropological publications. To the knowledge of the reviewer this system of publishing short articles when they are ready, whenever they are ready, whether they be twenty or two a year, is used only by the Middle American Research Institute and the Carnegie Institution of Washington. It is a system that could be profitably adopted by other institutions and organizations. When a suitable number of articles have accumulated they are compiled and edited with a table of contents. It is lamentable, however, that the Middle American Research Records, when compiled, lack the useful index which accompanies the compiled volumes of the *Notes on Middle American Archaeology and Ethnology* of the Carnegie Institution of Washington.

Archaeology: The nine papers on archaeology vary in their subject matter from early textiles from the Cieneguilla Ranch in the state of Chiapas, Mexico by Lila O'Neale (No. 1) and glyphic studies by the late Hermann Beyer (Nos. 7 and 8) to notes on pottery spindle whorls from Quelepa in El Salvador by John Longyear III (No. 3) and crematory jars from Chiapas and their distribution in Mesoamerica by Robert Wauchope (No. 2). Three articles are particularly worthy of further comment. Philip Drucker's report on his survey of the Chiapas Pacific coast (No. 11) is a welcome study of this archaeologically little known region. The fourteen archaeological sites investigated by him show close connections with the Guatemalan Pacific coastal regions and serve as a further indication of the archaeological unity of eastern Chiapas and western Guatemala. These similarities indicate close trade relations and point to the possibility that many of the so-called Mexican influences that eventually penetrated the Guatemalan Highlands reached them by way of the Pacific coastal route. The strongest evidence of this influence can be found in the presence of late Classic and early Post-Classic Tiquisate ware, San Juan and Tohil plumbate ware, effigy legs, spindle whorls, mold-made figurines, and copper

bells. There is also a striking similarity in the archaic complex as seen by the presence of solid, hand-made figurines, labial flanged bowls and Usulutan ware. One of the most important discoveries made by Drucker was the Islona de Chantuto site which, except for Longyear's non-pottery layer at Copan, is the only known preceramic site in Middle America. More systematic excavation in this area might greatly extend our knowledge of the little known foodgathering period in Mesoamerica.

Wauchope's report on the surface collection at Chiche, department of Quiche, Guatemala (No. 10) gives us additional information on the archaeology of the mid-western Guatemalan Highlands and supplements the data already available from his previous excavation at Zacualpa in the same region. According to the surface remains Chiche was predominantly an early Classic period site.

Probably the most outstanding article in the archaeological group is Wauchope's "A Tentative Sequence of Pre-Classic Ceramics in Middle America" (No. 14). In this a bold attempt is made at a ceramic breakdown of the Pre-Classic period in Mexico, Yucatan, Guatemala and Honduras based on the reports available on these regions. He coins the following stage names for the Pre-Classic period: Village formative, Urban formative, and Proto-Classic. Although the reviewer is not in complete accord with the names chosen, feeling that there was no true village and especially no urban centralization during the Pre-Classic period, the methods by which Wauchope arrives at his conclusions are to be highly commended. It is also felt that, in addition to the otherwise excellently chosen list of ceramic traits, the following Pre-Classic features would have given additional support to Wauchope's final chronological sequence (fig. 2) of archaeological sites: pattern burnishing, labial flanges, incensario features, effigy vessels, shoe-shaped jars, comales, tall footed tripod cups, perforated stone rings, stamps or seals, effigy whistles, and in general, characteristic early stone sculptures.

Physical Anthropology: This group is represented by two articles written on the dermatoglyphics and functional lateral dominance of the Zinantec, Amatenango, Huixtec and Tzeltal-Maya groups (No. 6) and on the anthropometry of the Chol-Maya Indians of Chiapas (No. 9) respectively. The anthropometric methods employed were those of Hrdlicka and the authors (Leche, Gould and Thorp) base their conclusions on a wide variety of measurements, indices, and observations which accompany the text in chart form. Unfortunately some of the samples are quite small but because this was unavoidable the results are presented with a warning to the reader that this fact should be kept in mind. Morphological observations are supplemented by excellent, standardized photographs, full-face and profile, of each subject. An interesting series of photographs were added of eight Lacandon Indian men, those remote and vanishing people of the Chiapas forest. It is indeed unfortunate that the group was too small to make measurements significant.

Ethnology: The two papers in this group (Nos. 15 and 16) concern modern pottery making particularly as it has persisted in some regions from pre-historic times. According to Silvia Rendon (No. 15) the applied and stamped decorative techniques used on the present day pottery of Riotenco San Lorenzo, Cuauhtitlan date back to the Huaxtec pulque vessels and may have originated as early as Teotihuacan IV. Furthermore she feels that the stamped representations of the Virgin of Guadalupe, so frequent on modern Cuauhtitlan jars, can be traced directly back to a Huaxtec fecundity goddess. Doris Stone's paper (No. 16) concerns the present day, handmade process of pottery making in the Chorotegan area of the Nicoya peninsula, and in addition gives an interesting picture of the economy underlying this craft. Recently increased demands for Chorotegan pottery, according to Stone, have stimulated a small-scale industrialization in the pottery making business and have been responsible for many innovations in decorative technique.

Applied Anthropology: Paper No. 12 deals with an educational cooperation between the United States and Guatemala. The program was carried on by the Inter-American Educational Foundation, Inc., in collaboration with the government of Guatemala. The three year agreement was signed in 1944 by both governments and Dr. W. Griffith, the author of the present article, was appointed the special representative of the United States. The first step of the program was the construction of a new functional curriculum for the Guatemalan rural schools. The second step was the establishment of a new Regional Rural Normal School for teachers in the Cakchiquel Indian area. After the successful initiation of the program the newly created Guatemalan Department of Rural Education was expected to assume responsibility for the continuation and extension of the work. Dr. Griffith's description of this project, the problems met and the progress made, is an excellent example of applied anthropology and shows clearly that educational collaboration is probably one of the most direct and useful ways of extending the good neighbor policy.

Social Anthropology: A stimulating paper by Oscar Lewis (No. 13) treats the land tenure and economics of the Mexican *Municipio* of Tepotzlan in the state of Morelos. The article is concerned primarily with the conflicts between the hacienda and free village systems, the latter represented by the *municipio* of Tepotzlan. Many of Lewis's findings based on statistical evidence contradict the earlier (1930) published results of Redfield's study. In contrast to Redfield's statement that each Tepotzlan family owns its own land Lewis is able to prove that 64% of the families owned no private land in 1944 and that the national *ejido* program, contrary to popular belief, has by no means solved Mexico's land problem for 384 out of 853 families in the *municipio* of Tepotzlan remain landless with very little prospect of becoming landowners in the near future. The *ejido* program may have solved the problems of the villages

that had lost their lands since the Conquest but in such villages as Tepotzlan which has maintained its communal landholdings, it served to weaken the power and prestige of local government and increase centralization. In this way the *ejido* program may have accelerated "acculturation" processes in Mexico by making the villagers more dependent on the central government.

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Hopewellian Communities in Illinois. Thorne Deuel, ed. Vol. V of Scientific Papers of Illinois State Museum. 271 pp. 94 pls., 15 tables. Springfield.

This attractively designed volume is a collection of six articles which set forth very clearly the nature and chronology of the very important Hopewellian culture in Illinois. The first paper, by Winslow M. Walker, describes the excavation of two small conical burial mounds in the Dickison Mound Group in Peoria County. These mounds proved to be similar; both contained central log-roofed vaults in which the majority of the skeletons was found. Artifacts found with the burials were of characteristic Hopewell types.

In the second paper, John C. McGregor reports on the fieldwork of MacNeish at the Havana Site. The Hopewellian character of this locality has been known for some years, principally through the work of Warren K. Moorehead. This additional excavation was necessitated by the fact that a power plant was to be built on the site and a portion of it would be destroyed. Several of the mounds were trenched, but the most significant discoveries were made in the village site that underlay the mounds and the surrounding fields. One interesting feature was the post moulds of an oval shaped building. The tests in the village were excavated in arbitrary levels and McGregor's analysis of the recovered pottery gives evidence of time change in the pottery. A few trade sherds serve to relate this chronology with the Hopewellian of both the Upper and Lower Mississippi Valley.

James B. Griffin names and briefly describes the ceramics of the Hopewellian time horizons of Illinois in the third paper. This is a stimulating discussion of both chronological position and relationships of the different pottery types, a summary of the ceramic information reported in the accompanying papers as well as a consideration of the evidence that has been accumulating from excavations in other parts of Illinois. Classification of early Illinois ceramics was placed on a logical basis by a conference held at the Illinois State Museum in 1951 and the clarity of Griffin's discussion, as well as the ceramic discussion sections of the accompanying papers, is largely due to the work of this conference.

Present evidence clearly indicates that the earliest ceramics are the Black Sands and Morton complex of types. Types which Griffin has grouped into a "Havana Ware" and the classic "Hopewell Ware" fall into a middle period. The "Weaver Ware" types mark the late phase of the Hopewell Culture.

The fourth paper describes results obtained at the Clear Lake Site in Tazewell County. Stratigraphic tests made in the deep refuse by a party from the University of Chicago in 1932 (Cole and Deuel, "Rediscovering Illinois," pp. 181-91); Mr. and Mrs. George Schoenbeck in 1945; and by Melvin Fowler in 1950 are analyzed and compared. What appear to be excellent stratigraphic results are obtained on the basis of surprisingly few sherds. In addition a rather lengthy inventory of Hopewellian traits from the Clear Lake Site is presented, based on the collection made by Mr. and Mrs. Schoenbeck.

George Neumann and Melvin Fowler report on the excavation of two sites in White County, Illinois, in the fifth paper. At the Wilson site the largest of the ten small conical mounds was excavated and contained a central log-roofed tomb. The work of local collectors in other mounds is reported and it is evident that all conform to the Hopewellian pattern. A cemetery was also found and excavated, providing well-preserved skeletal material that was analyzed by Neumann. Excavation of the near-by Hubele village site yielded a good collection of ceramics and other Hopewellian artifacts but no new information on buildings.

In the final paper, Thorne Deuel has assembled and interpreted the accumulated information on the Hopewellian culture of Illinois. The fairly abundant data made it possible for Deuel to give a rather well-rounded picture of the period.

The papers in this volume, other recent analyses of western Hopewellian chronology, and radiocarbon dates have finally convinced the reviewer that the early phases of Upper Mississippi Valley Hopewell pre-date the distribution of this culture to other parts of the East. These studies also raise for serious consideration the problem of whether the essential parts of the Hopewell culture were not transferred directly from northeastern Asia. The remarkable similarities that early Hopewell shares with the Afanasiev and Andronovo stages in the valley of the Yenisei and the Jomon Period in Japan can no longer be ignored.

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April 7, 1953

The Crable Site, Fulton County, Illinois. Hale Gilliam Smith. Anthropological Papers, Museum of Anthropology, University of Michigan, No. 7. University of Michigan Press, 1951.

The Crable Site report is based to a great extent upon the analysis and interpretation of excavations which were conducted by amateurs in an unsystematic and non-scientific manner. The reconstruction of a site by the use of such data places this monograph in a class

with the works of Bennett on the Apple River Focus, Quimby on the Goodall Focus and J. W. Griffin on the Fisher Focus. Obviously, such work can not hope to achieve the control and refinement of analyses based upon professional excavations. However, the reworking of early reports such as those mentioned indicates that a great deal of historical and scientific knowledge can be gleaned from collections and notes. One could even suggest that there is a fruitful area of investigation in the "archeology of archeology."

The descriptions of the artifact assemblage reflect a bias resulting from the nature of available material. The University of Chicago and various amateurs made limited excavations in the village but only a small amount of data was available. Most of the pottery and the more significant artifacts came from the McGirr collection which represented grave goods from a limited number of cemetery and mound locations. Similar pottery types do occur in the village, so that generalizations about the site are probably valid in spite of the disproportionate attention to grave goods. A protest may be raised about the illustrative plates. The designs on the Crable pots do not show clearly enough to indicate the combination of Oneota style with elements of the "Southern Cult." The drawings of Crable deep-rimmed plate are somewhat misleading, for in many instances there is a sharper division of rim from base than is indicated.

The section dealing with the ethnic affiliations of the Crable Site should have been elaborated as a separate monograph if it was intended to be a valid analysis of the cultural groupings to which references are made. It is doubtful that the identification of the Crable Site with the Peoria depends upon a consideration of the material culture of tribes in such distant localities as Minnesota, South Dakota and Nebraska. In any case, a detailed consideration of broader cultural affiliations would require much more intensive analysis than is presented.

The historical importance of Crable can not be minimized by the limited excavations or the qualified interpretations. The site was thought for a long time to be unique in its combination of Spoon River, Oneota, and Southern influences. Comparable sites are now known from Peoria to St. Louis and indicate a full cultural and historical period. Crable remains outstanding in the quantity and variety of reported artifacts and remains the type station for a proto-historic horizon. The Crable deep plate is recognized in Kaskaskia and Madisonville as a time indicator for proto-historic sites. Unless one assumes extremely rapid and undocumented tribal movements, the identification of the Crable complex with the Peoria seems the only reasonable ethno-historical interpretation.

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The Archaeology of the Santa Elena Peninsula in South-West Ecuador. G. H. S. BUSHNELL. Occasional Publications of the Cambridge University Museum of Archaeology and Ethnology No. 1, Cambridge, England, 1951. 155 pp., 5 plates, 52 figs. 42s.

This report presents the results of excavation and survey in south coastal Ecuador conducted by G. H. S. Bushnell during the years 1936-37 while employed as geologist for the Anglo Ecuadorian Oil Co. Six excavations were carried out in cemeteries and refuse deposits at two large sites. One of these is located within the village of La Libertad, on the north side of the Santa Elena Peninsula, while the other is to be found on high ground immediately to the west of the town. The area surveyed extends north to Manglar Alto, east to Chongon, and south to Chanduy. Although no effort was made to dig the refuse deposits in stratigraphic levels, Bushnell believes that he has isolated four cultures, or horizons. These are, from early to late, Pre-Guangala, Guangala, Engoroy, and Manteño, the latter having been originally described at Jocay (Manta) by Jijón y Caamaño.

Pre-Guangala is represented primarily by a hard, well polished pottery ranging in color from reddish brown through chocolate to black. Decoration is by engraved lines and dots with, occasionally, applied pellets being added to the outside of vessels. Associated in small quantity is a yellowish ware decorated with crude black or red designs.

The majority of Guangala material was obtained from two excavations, though a number of items were also obtained through survey and by purchases at the village of Guangala. It is not always clear, unfortunately, as to which items were purchased, and therefore of doubtful provenience and affiliation, and which were actually collected by Bushnell.

Out of eleven different ceramic types listed, the most common would appear to be that referred to as Guangala Red Ware, which shows considerable variability and includes grater bowls and five legged, or polypod, vessels. Another, somewhat less common, type is Guangala Sombre. This is basically a grey ware occasionally decorated by the pattern polish technique or by a thin, iridescent, paint. Also characteristic, though occurring in small quantity, is a polychrome pottery with red and black designs, often in the form of pelicans and lizards, on a yellow base, and a red on yellow pottery known as Guangala Two Color Ware. There are several other bichromes, including a white on red ware, and two monochrome wares decorated by incising and appliqué.

Ceramic artifacts consist of such items as side-flutes, mold-made whistle figurines, stamps, modeled spindle whorls, and ear and lip plugs. Shell objects range from grooved weights and celts to fishhooks, spear thrower hooks, nose rings, and even a shell box. Polished stone celts and chisels are present as are drills, obsidian flake knives, and a number of chert blades. Metates are rectangular slabs while manos are either rod-shaped with knobbed, overlapping ends, or oval stones with two flat

ground faces. A stone amulet of the whale tooth type found at Cocle is also present. Copper objects appear typical of the Guangala culture, celts, tweezers, fishhooks, and straight pins having been made of this metal.

Whereas the Guangala excavations produced a wide variety of pottery and artifacts, the Engoroy cemetery was limited in its contents. Ceramics seem restricted to what Bushnell calls Engoroy Gritty Brown, Engoroy Sandy Grey, and Engoroy Polished Grey wares. Although not too well described, this latter would appear to be closely related to Bushnell's Guangala Sombre pottery. Associated with the above are specimens of Guangala Red Ware which Bushnell regards as having been "stolen" from the presumably earlier Guangala deposits. Artifacts consist of polished stone celts, stone drills or reamers, shell rings, and shell fishhooks. Copper is lacking.

The two Manteño excavations, in the village of La Libertad, produced Red Ware burial urns and a quantity of grey pottery. This latter was either plain, or decorated by pattern polished lines, incising, or engraving. In a few cases the collars of large jars have been decorated by the application of a mold-made human, or animal, head in typical Manteño style. Mold-made figurines, flat stamps, and incised spindle whorls, often decorated with a pelican motif, make up the list of ceramic artifacts. Metates are of the slab type and manos are of the elongated, overlapping style with knobbed ends. One pestle was also encountered. Polished celts and chisels are notably absent while chert and obsidian artifacts are described as rare. Copper, however, is well developed and Bushnell illustrates an interesting series of molds that were used to cast copper implements.

Also excavated by Bushnell was a post-conquest cemetery in the fill of which were a number of sherds not found in his other excavations. Glass beads and other historic artifacts were found with the burials.

Bushnell's placement of his Engoroy culture as post-Guangala and pre-Manteño may be correct, but to this reviewer a good case can be made for the Guangala culture as the immediate predecessor of Manteño. Thus, such items as spindle whorls, mold-made figurines, slab metates, overhanging, knobbed manos, and copper artifacts are found in both the Guangala and Manteño cultures but absent, or at least have not yet been encountered, in the Engoroy material. Also, the presence of the pelican motif in Guangala pottery and in Manteño spindle whorls, plus the use of the pattern polish technique of decoration in both cultures, and their absence in Engoroy ceramics, is also significant. Should the Engoroy material underlie Guangala one might re-interpret Bushnell's presumably "stolen" Guangala Red Ware vessels as merely representing an earlier occurrence of this pottery, while the Engoroy Grey Ware, with its iridescent paint designs, might well represent a precursor of Guangala Sombre, which is also basically a grey ware and occasionally carries a similar iridescent painted decoration.

In relating the Santa Elena Peninsula material with other areas Bushnell finds his most specific parallels with Costa Rica. This, he feels, resulted through local contact, perhaps by sea, rather than through a process of overland diffusion. Any strong relationships to the south seem not to exist, though now that the Viru Valley reports have started to come out, one notes a general similarity between grater bowls from that region with those from Bushnell's Guangala horizon. The apparent lack of similarities between Peru and Ecuador have been noted by several authors. These attempted comparisons have usually been made with primary reference to the ceremonial aspects of material culture which, because of differing emphasis, may not have been as susceptible to outside influences as other cultural aspects. Everyday household utensils, on the other hand, may well have been influenced by Peruvian traditions, and it is perhaps on this level that, when we know more about these items, comparative studies will begin to show more than a casual relationship.

Although this reviewer would differ with Bushnell's interpretation of the sequential placement of his various cultures such differences are slight in the light of his splendid, well illustrated record of what was, at that time, a side-line activity of this geologist-turned-archaeologist. The book is a well planned, excellently written volume on a little known region and richly increases our knowledge of Ecuadorian coastal archaeology.

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NOTES AND NEWS

EARLY MAN

The publication, by George F. Carter, of "Interglacial Artifacts from the San Diego Area" (*Southwestern Journal of Anthropology*, Vol. 8, No. 4, 1952), has given rise to further speculations about the presence of man in the New World in pre-Wisconsin times. While many archaeologists will have doubts that the objects illustrated by Carter are true artifacts, the problem is worth careful attention. It would be well for all students of early man to be on the lookout for similar material elsewhere. Geological situations must be studied with great care, as well as the problem of human manufacture *versus* natural agencies in the chipping and battering of the stones. A number of localities from different parts of North America are now under scrutiny.

Phil C. Orr of the Santa Barbara Museum of Natural History reports that the Museum's Sixth Santa Rosa Island Expedition has further investigated human deposits at depths of 10 to 36 feet beneath river deposits, first discovered by the Third and Fourth Expeditions. Human bone, shell, and occasionally artifacts, are found exposed in deep gulleys which have cut into old valley fills to depths of 50 feet. In three cases, Orr believes that the human material has been traced to a source in inhabited caves in the hills above. The geological history is "quite plain," showing that the river deposits were made during a pluvial stage of long standing in which river sediments were carried to the sea, forming deltas. In the following dry conditions, the reduced delta deposits could not compete with sea erosion and sea cliffs were created. The resulting lowering of water level caused the erosion of the deep gulleys found today. Orr states that these conditions seem much the same as those described by Carter for the San Diego area, but that in the case of Santa Rosa Island, it appears that post-glacial changes in rainfall were responsible, rather than interglacial change in sea level. Further work is planned here by the Seventh Expedition in the fall. Orr is making comparisons between the deeply-buried artifacts and those described by Carter.

Orr also reports progress in what he calls "speleological dating." This is a projection of dates obtained by measuring the thickness of speleothem coating on objects of known age. Iron nails coated in this fashion were found in Moaning Cave, Calaveras County, California, by the Truman Expedition of the Santa Barbara Museum of Natural History. By measuring the amount of speleothem accumulation on the nails, known to have been there 29 years, Orr postulated a minimum age for the oldest human deposits of about 12,000 years, for they were under 420 mm. of speleothem (Phil C. Orr, The 1952 Excavations in Moaning Cave, *Santa Barbara Museum of Natural History, Dept. of Anthropology, Bull. 1*). Later, the Museum and members of the Western Speleological Institute discovered a miner's pick known to have been in the cave since the early 1850's, and to have been removed 70 years later. Measurements by O. H. Truman of the coating confirm the rate of accumulation based on the previous, 29-year record. The projected average of about 1 inch of speleological accumulation per 1000 years goes far toward indicating the antiquity of the remains from Moaning Cave. The Western Speleological Institute, Nevada State Museum, and Santa Barbara Museum are cooperating in extending this method to other caves.

During the winter, Henry Meyer of Georgetown, Texas, reported to Krieger his collection of several score heavy quartzite stones, found in a small area in his back yard. Meyer had for some time been digging these up and saving them for two reasons: first, no such stones could be found elsewhere in the black prairie soil about his home, and he thought they must have been carried up there from a stream bed a mile away and about 300 feet lower, where they are common; and second, many of the stones are rudely pointed with shallow depressions around the middle which would make them easier to grasp in one or both hands. Meyer did not think they were actually manufactured by man, but selected from large quantities of stones in the stream bed mentioned, and used for pounding or grinding. Krieger believes the objects to be unique in central Texas archaeology and does not see that they can be fitted into the current fairly well established chronology of that region in post-glacial times. While the case can only be said to have certain potentialities for study, Meyer is to be commended for being so observant.

Two similar cases developed during the spring. Rex Rodgers of Tulia in the Texas Panhandle wrote to Carter about a large number of tough, quartzitic stones obtained by him in archaeological sites in Tule Canyon beneath the break of the Plains, stating that some of them seemed to be crudely fashioned by percussion. Samples were sent to Carter and Krieger. Both men thought their status as artifacts quite doubtful, but that a problem was indicated which deserves further study. Jack T. Hughes, geologist and archaeologist at the Panhandle-Plains Historical Museum in Canyon, Texas, examined the sites with Rodgers and reported the stones were eroding from a deep formation of Pliocene age or older. Among Rodgers' collection, he states, are some good cores and choppers of the same material, and presumably originating in the same formation, but from fairly recent campsites. Hughes further states that many of the stones found in place in the Pliocene (?) gravel, "rather than being smoothly rounded, are angular and battered; practically all of them would be considered possible anvils, hammerstones, choppers, etc., if found with definite evidence of occupation." Although the geological age of this gravel makes human agency out of the question, it is nonetheless valuable to science to know that a fortuitous combination of fracturing qualities of particular stones, plus natural mechanical pressures in a stream bed, would produce objects that would be called artifacts if found in positive association with a human occupation site. Thus the

further pursuit of such a situation is worth the effort, and the presence of a primitive industry may yet be forthcoming in this area.

Another discovery, by Mr. Carmen Baggerly of Imlay City, Michigan, provides further intriguing material for deciding where the boundary may lie between man-made artifacts and natural fracturing. In this case, both stream action, and pressure of stones against one another by ice advance, are involved. Baggerly provided Carter with samples of such stones taken from sand bars and a moraine along the Imlay channel, one of the outlets for the later stages of Glacial Lake Maumee. This outlet river once flowed north to about nine-miles above Imlay City, curved westward across Michigan, and emptied into the Mississippi system. The channel is a mile wide or more in places. A group of sand-bar sites lies within a part of the channel which barely escaped closing by re-advances of ice of Wisconsin age. Some waterworn specimens were found above high watermark on the moraine which forms the east bank.

Baggerly has collected about 2000 specimens from positions in this channel and moraine, all of hard quartzitic and argillaceous rocks. He describes these as choppers, chopping tools, pick-like implements, cores, hammers, and scrapers of keeled, beaked, and pointed shapes, with flaked blades and projectile points quite absent. He further states that many of the waterworn specimens of quartzite have parts of the original cortex remaining, showing patination or filming on that surface, but little or none on the worked facets. Some are not patinated or altered on any surfaces but all the facets are waterworn. Argillaceous stones show surface alteration and change of color on all surfaces of all specimens. Ice planing is evident on some stones already waterworn.

After receiving the above notes, Krieger received a shipment of 80 specimens, including both "artifacts" and "waterworn stones." Krieger, along with George C. Engerrand, University of Texas (who long ago reported very primitive stone industries from Campeche and Baja California, Mexico), and Glen L. Evans, geologist and archaeologist of the Texas Memorial Museum, examined this shipment. All three find it difficult to state that any of the specimens are artifacts beyond question. On the other hand, they concur in believing that at least eight or ten of them present fracture facets that would be very difficult to explain as accident or by rocks simply stubbing against one another. Four or five of the objects can rather safely be called "choppers," one side with original surface unbroken conveniently fitting into the palm, and the other presenting facets of fresher aspect than the heel, converging toward a rude point. Some thick spalls might be termed scrapers, with a few facets along one edge rather than scattered around the specimen.

While extreme caution is urged, these problems cannot be ignored or shrugged off. If interglacial artifacts are present in America, they will of necessity be of very crude nature. Equally crude ones can be found for cultural complexes certainly post-glacial, as in the Chalco of central Mexico and Chiricahua industry of the Southwest. Hence careful geological study is fully as important as the knotty problem of what constitutes an artifact. The non-professional observers who have reported their observations are to be highly commended, wherever these matters finally lead. During the second week of April, 1953, a University of Arizona group led by E. W. Haury made additional excavations at the mammoth station at Naco, Arizona. The trip netted sufficient charcoal for at least two separate radioactive carbon analyses. Also two leg bones of the animal resting on slightly higher ground than the main portion of the carcass were recovered. This suggests that ancient hunters dismembered the animal and considerably disarranged portions of it after their successful kill.

ARCTIC

Field work in the southern Alaska area is to continue during 1953 under an Arctic Institute grant-in-aid to Frederica De Laguna. The leader of the field party will be Francis A. Riddell, who will excavate in the Yakutat area with the aid of Kenneth Lane, Donald McGeein, Robert Anderson, and Albert Olson, all of the University of California. De Laguna will not take part in the field work, but intends to work with Catherine McClellan on the ethnographic notes compiled during previous summers.

The Harvard Peabody Museum group will return to Point Barrow for a third season of excavation in the Birnirk and neighboring sites under the field direction of Wilbert Carter. This project is supported by the Arctic Research Laboratory.

Helge Larsen writes from Denmark that he and Jorgen Meldgaard expect to journey to Greenland during the open season in search of "the first Greenlanders." It is interesting to find that the idea of early man is attaching itself to the eastern Arctic with the possibility that artifacts previously identified with the Dorset culture may need re-evaluation.

Alex Ricciardelli, University of Pennsylvania, will act as archaeologist of a National Park Service party exploring the northeast corner of Alaska this summer. This is a spectacularly rugged mountainous area near the Canadian border and the Arctic Ocean in which have been reported limestone caves and signs of Indian or Eskimo occupation. No archaeologist has previously visited the region.

Ivar Skarland will supervise a survey of the Susitna Basin of Alaska under a contract between the National Park Service and the University of Alaska.

J. L. Giddings, Jr., University of Pennsylvania, intends to continue his study of timberlines and associated archaeology in the Churchill area of Hudson Bay.

PACIFIC COAST

There will be two parties from the University of Washington in the field this summer. One is led by Earl H. Swanson from the University of Washington. His group will work in caves in the Vantage area on the Columbia River. The project is supported by funds from the University of Washington and the American Philosophical Society. The second party will be led by Warren Caldwell, also from the University of Washington. This group will work at the Wakemap Mound at The Dalles, Washington. The project is supported by funds from the National Park Service. Both projects have been organized and will be directed by Douglas Osborne.

Richard D. Daugherty, The State College of Washington, Pullman, Washington will be in charge of a small crew on an eight weeks project at a cave near the mouth of Palouse River in eastern Washington. Funds for this project have been supplied by Mr. John M. McGregor of Hooper, Washington.

According to Louis R. Caywood, The National Park Service arranged for a survey of the petroglyphs in The Dalles Reservoir Project on the Columbia River. David Cole and Jack Hegrenes from the University of Oregon worked during the Christmas vacation on this project. The survey was made to record the very fine petroglyphs on the north side of the Columbia River near Wakemap Mound. However, the entire reservoir area was recorded by the two students. A report prepared by them will be made to the Corps of Engineers as part of the River Basin Archaeological Salvage program.

The National Park Service has also arranged for L. S. Cressman and a group of students to make emergency archaeological tests at a site in The Dalles Reservoir Project in response to a report from the Corps of Engineers that construction on the relocation of the Union Pacific Railroad and U.S. Highway No. 30 would destroy a large village outside the reservoir area.

Contracts have been made between the National Park Service and the Universities of Washington and Oregon for archaeological salvage excavations to be done in The Dalles Reservoir this summer. A contract has also been made with the University of Southern California to begin the archaeological survey of Death Valley National Monument. William J. Wallace will be in charge of the work.

Caywood also reports that the National Park Service has arranged for a contract with the University of California for excavations in the Red Bank and Nimbus Reservoirs in Central California.

A bulletin has been published by The Nevada State Museum on excavations by Phil C. Orr in caves in Pershing County, Nevada. This is an initial step in what is hoped to be an expanding program of study of Nevada's prehistoric cultures. (Phil. C. Orr. Preliminary Excavations of Pershing County Caves. *The Nevada State Museum Department of Archaeology*, Bulletin No. 1. Carson City, Nevada. Dec. 1952.)

The Department of Anthropology, University of Utah, is continuing studies in Utah's prehistory in two areas. Jesse D. Jennings, with a group of students, has returned to Wendover, Utah, to carry out additional studies in Danger Cave. This season excavation in the cave will be concerned primarily with the checking of various aspects of the previous excavations, seeking additional data bearing on all occupation levels of the cave. Additional specimens will be collected to check and supplement previous radiocarbon dates.

Jack R Rudy of the Statewide Archaeoolgical Survey is engaged in limited sample excavation and additional survey studies in the Beef Basin-Ruin Park area southwest of Moab, Utah. This area, which has been relatively inaccessible in the past, has recently been opened up by the construction of roads into the Basin and is now subject to vandalism. The excavation and survey work therefore is primarily a salvage operation to make as many collections and gather as much data as possible before the area suffers the same vandalizing as in many other regions in the Southwest and elsewhere. The preliminary surveys of last year indicate that the area is culturally, by and large, part of the Mesa Verde complex; however, little is known of this northward extension of the Anasazi into this part of Utah.

William J. Wallace, University of Southern California, reports that a weekend field class of the University is excavating a rock shelter in Little Sycamore Canyon, Ventura County. This excavation is part of an intensive survey of the canyon, and the rock shelter is the third site thus far explored. It contains a deep deposit which seems to be culturally stratified. A field party of eight continued an archaeological survey of Death Valley between semesters. To date, 123 sites representing three distinct cultures, two giving some indication of antiquity, have been discovered and mapped. The Death Valley survey will be resumed in June.

The Archaeological Survey Association of Southern California held its winter meeting at the Southwest Museum on January 31. David Rice was re-elected president. An active program of desert reconnaissance is scheduled for 1953, with at least one major trip each month. One trip has been made to Deep Creek, near Victorville.

C. W. Meighan, University of California at Los Angeles reports that in January H. E. Eberhart and C. W. Meighan conducted an archaeological survey of San Nicolas Island, recording and mapping about 60 sites. U. C. L. A. students M. Kowta and J. C. Hurst are excavating Triunfo Cave about 25 miles north of Los Angeles. The dry cave has yielded basketry fragments, wooden arrow foreshafts, and bone awls. The archaeological methods class of U.C.L.A. spent the fall semester in additional excavation of the Pt. Dume site, a relatively early coastal midden containing an abundance of manos, metates, and crude core tools.

D. L. True, Pala, California, is preparing a manuscript on his extensive archaeological survey of the Pauma Valley, San Diego County.

NORTHERN MISSISSIPPI VALLEY

ILLINOIS. The activities of the Anthropology Section of the Illinois State Museum this summer will be devoted to working up reports on previous work and conducting site surveys. Prominent in this program will be the work of J. Joe Bauxar and Melvin Fowler on the LaSalle County material and the village of the Illinois Confederacy on the Kaskaskia River (Randolph County). It is hoped that this can be ready for publication this fall. The study is a joint undertaking of the Department of Anthropology of the University of Chicago and the Illinois State Museum and will be published by one or both of these institutions.

John Buettner-Janusch and Howard Winters of the Department of Anthropology of the University of Chicago will conduct excavations in a rock shelter partially dug by the Illinois State Museum last year in Randolph County. This work will be carried out under joint sponsorship of the Museum, the University of Chicago and the Illinois State Archaeological Society.

Gregory Perino of Belleville, Illinois, and Preston Holder of Washington University in St. Louis will conduct a dig this summer in a Woodland site in the vicinity of East Saint Louis.

MISSOURI. The University of Missouri has negotiated an agreement with the National Park Service, Region Three, for archaeological survey and excavations in the Table Rock Reservoir area this spring and summer. Carl H. Chapman will direct the work. The excavations are to be coordinated with the University of Missouri 7th Field Session which will be held from June 8th to August 1st. Three small bluff shelters are to be excavated and one large village site, located in a borrow pit area which will result in its destruction as soon as construction on the Table Rock Dam is begun, will be tested. Compilations are continuing on the results of the surveys and six test excavations conducted in the Pomme de Terre Reservoir area last summer and fall. Information has to date been compiled on 138 sites located in the area. A report on the work is in progress. Excavations have been continued in Graham Cave. The Missouri Archaeological Society and the University continue to cooperate on this project and it is expected that it will be possible to complete the excavation of the areas now under investigation before the summer.

The Missouri Archaeological Society has established an Award Certificate for outstanding amateur archaeologists, and has appointed the following committee to select the awardees: Thorne Deuel, Chairman; Waldo R. Wedel, and Virginia Watson. These certificates of recognition will be presented to an outstanding amateur at the spring meeting of the Missouri Archaeological Society each year. The first will be awarded at the meeting of the Society at the Student Union of the Southwest State College, Springfield, Missouri, Sunday, May 3.

INDIANA. Archaeological Field School will be conducted at Angel mounds during the coming summer for a ten week period starting June 15. In addition to excavations at Angel site, it is probable that a small burial ground some five miles up the Ohio River will also be explored. Perry County will be surveyed by a graduate student as a part of the long-range program of the Indiana Historical Society. A Woodland site north of Indianapolis will be excavated by J. G. Householder for the Indiana Historical Society.

MICHIGAN. The University of Michigan will again conduct a field school near Killarney, Ontario, under the direction of E. F. Greenman. J. B. Griffin plans an extensive European trip to study the collections of European museums with particular reference to the problem of prehistoric Eurasian-American cultural connections. A. C. Spaulding plans a survey trip in the Upper Peninsula of Michigan to investigate the problem of the association of archaeological sites with Late Pleistocene beaches; the survey will be made in cooperation with Mr. and Mrs. John Dimick of Washington, D.C. The Museum of Anthropology will continue its research program in the Central Mississippi Valley with a small field party.

E. F. Greenman would like to hear from anyone who may know of the whereabouts of a map of Hopewellian mound groups in Grand Rapids prepared about 1876 by Wright L. Coffinberry in connection with his unpublished report on his excavation of the mounds. The map may have been lent to some library or museum outside Michigan.

SOUTHWEST

At the University of Colorado Museum, Herbert W. Dick published a paper entitled "The Status of Colorado Archaeology with a Bibliographic Guide" (*Southwestern Lore*, Vol. 18, No. 4, March, 1953) to serve as an inventory of archaeological accomplishments in the state and as a guide to areas and problems requiring new or additional research. During the summer, the Museum will undertake surveys and excavations in the northeastern foothills of the Rocky Mountains where little is known concerning the cultures of post-Paleo-Indian times, in partial fulfillment of some problems raised in Dick's report.

Plans for summer field work at the Museum of New Mexico were not completed when this report went to press, but Stanley Stubbs hoped to excavate a pre-1100 A.D. site near Santa Fe to supplement the rather scant knowledge of the earlier occupations in the Northern Rio Grande area.

At the University of New Mexico, Florence Ellis, assisted by several students, has worked on reconnaissance and some excavation of sites pertaining to ancient man in the Middle Rio Grande Valley which are characterized by points different from those of any hitherto described culture and a complex of other stone implements. The points resemble most the Bat Cave type points from the lowest levels of Dick's excavation

but do not duplicate them. During the summer, it is planned to excavate, with the assistance of students in a "Problems" course, a site which may reveal the stratigraphic relation of this new culture to that of Middle Rio Grande Basketmakers, whose locations are being exposed in "blow outs" in this period of rapid erosion.

Region Three Office of the U.S. National Park Service has scheduled the excavation of Hubbard Ruin, a triple-walled circular structure at Aztec National Monument, for a period beginning about June 1 and continuing into July.

The University of Arizona Archaeological Field School at Point of Pines opens for the eighth season on June 12 and will continue through August 7. The main object of the current season will be to clarify the cultural history of the region between 500 and 1000 A.D. Small-scale operations will also be continued on several special problems of the later centuries.

Pueblo Grande excavations, near Phoenix, Arizona, will be on a year-round schedule for some time to come and will continue during the summer. Part of the site selected for out-door museum exhibits is now being worked, and enough of the ball court has been uncovered to establish it as a late type with a north-south axis. Joseph J. Hoffmeier, a graduate of the University of California, joined the staff in November and is currently in charge of the dig.

The Museum of Northern Arizona and the University of Illinois will join forces to excavate Sinagua sites southeast of Flagstaff under the leadership of John C. McGregor, who will be assisted by a party of students. The expedition will be in the field from the end of June until early August.

Hugo G. Rodeck, Director of the University of Colorado Museum, and Mrs. Rodeck, assisted by a grant from the Wenner-Gren Foundation, spent six months touring the United States for the purpose of studying and photographing realistic pictures on Mimbres pottery. They travelled 16,000 miles and photographed 1500 pieces in 77 public and private collections, each containing from one to 306 pieces. Work is now going forward on the preparation of the manuscript and black-and-white drawings from the photographs. Rodeck will continue to welcome information on collections, large or small, which have escaped his notice.

At the Museum of New Mexico, a number of reports were completed: "Tonala, Mexico, an Archaeological Survey" by Edwin N. Ferdon (off the press); "Salvage Archaeology in the Chama Valley" by Fred Wendorf and others (off the press); "The Excavation of Pindi Pueblo" by Stanley Stubbs and W. S. Stallings (in press); and "The Excavation of Paa-ko" by Marjorie Lambert (manuscript completed). Ferdon was on leave during the year for graduate study at the University of Michigan. Wendorf conducted an archaeological survey along a gas pipe line from Farmington to Gallup, New Mexico, during April and May.

The Amerind Foundation, Dragoon, Arizona, reports the "Quiburi" report in press. Excavation of the Paloparado site is under way. It was chosen because of its position in relationship to the tribal areas designated by the Spanish chroniclers as the northwest corner of Pima proper, and because it was hoped that it would tie in with the Babocomari and Quiburi projects completed and a third to be undertaken next fall near Redington, on the lower San Pedro River. The project is aimed at a further study of acculturation, historical reconstruction, and prehistoric ties of the Sobaipuri Indians and the early Spanish. During the summer, analysis of the materials from the Paloparado site will be made as an historical base for the proposed excavation near Redington. The Foundation is actively engaged in gathering original data pertaining to the initial contact horizons in this area as an historic aid to future archaeological studies.

Odd S. Halseth, City Archaeologist at Phoenix, writes that he should have retired in May, 1953, but the City Council has requested that he continue under a special amendment which allows for four years' service beyond retirement age.

The Museum of Northern Arizona had a salvage excavation project during the spring. Robert C. Euler, assisted by Leland Abel and Milton Wetherill, made an archaeological survey and excavated twelve small sites along the right-of-way of a new section of U.S. Highway 66 east of Flagstaff.

The Hall of Man at the Denver Museum of Natural History was completed during the winter and dedicated on May 15, 1953. As soon as cases are completed, temporary exhibits will be installed. The long-range program embraces a hall which will depict the life of prehistoric people, both in the Old World and the New, through the use of dioramas as well as artifacts. The section of the Hall devoted to the Western Hemisphere will be completed first.

The Heard Museum, Phoenix, plans to reinstall three exhibit galleries during the summer to tell the story of Southwestern archaeology in comprehensive form, using colors, maps, and diagrams as well as the artifacts themselves. This will be the first attempt to modernize the exhibits, most of which were installed 25 years ago.

A number of Southwestern archaeologists presented papers in the Social Science Section, Southwestern Division, American Association for the Advancement of Science, held at Tempe, Arizona, April 20, 21, 22, and 23. Robert H. Lister was Chairman and Herbert Dick, Secretary of the section.

The Pecos Conference, annual get-together for Southwesternists, will be held at the Museum of Northern Arizona, Flagstaff, on August 17, 18, 19, and 20. Dr. Harold S. Colton is chairman of the committee.

Robert H. Lister of the University of Colorado will work in northwestern Chihuahua from June 10 to July 20, continuing a project begun last season. Caves producing Mogollon material will be revisited, and additional caves will be excavated. The Sixth Annual Field School of the University of Colorado will excavate a small mesa-top site in Mesa Verde National Park in cooperation with the National Park Service.

SOUTHEAST

FLORIDA. The newly reorganized Florida State Museum, a division of the University of Florida, has added an archaeologist, Ripley Bullen, to its staff. He will serve as Curator of Social Sciences. In addition to usual curatorial duties, excavations and other research activities are planned for the future.

Bullen, in collaboration with Herbert H. Winters of the Florida Geological Survey, excavated a stemmed, Archaic type, flint spear point which was in direct contact with fragmentary bones of a Pleistocene fuana at the Seminole Field fossil area. The point, as well as three chips of chert, came from a narrow fossil-producing zone which Bullen believes is a stream deposit, suggesting the association to be fortuitous. A report by Bullen and Winters is expected to appear in an early issue of *The Florida Anthropologist*.

The Florida State Museum is entering into a contract with the National Park Service for excavation of several sites, to be flooded by the Jim Woodruff Reservoir, on the Florida side of the Chattahoochee River. Bullen expects to excavate these sites this coming June.

John M. Goggin, assisted by his University of Florida students, has been continuing the program of survey and excavations in coastal Dixie County. Many new sites have been discovered and further stratigraphic excavations have been made at Shired Island. Excavations now in progress at Hughes Island Mound (Di 45), a Weeden Island I burial mound, promise to throw new light on certain controversial questions associated with the Weeden Island culture.

The University of Florida is continuing its program of historic archaeology, surveying for new sites and surface collecting at previously known ones. Excavations made this spring at the Zetrouer site will probably finish work there. A report is now being prepared by Lillian Seaberg. Additional excavations have also been made at the Fountain of Youth site, St. Augustine.

Excavations at the historic La Leche Mission site in St. Augustine are being made by the Rev. Charles Spellman. John M. Goggin is acting as a consultant and the laboratory facilities of the University are used for processing materials. Students are aiding in field and laboratory work. General and stratigraphic excavations so far have indicated a minor occupation of the site in Orange and St. Johns periods with the major occupation in late St. Augustine times, i.e., post-1700. Masonry foundations, as yet not completely excavated, may be those of Nombre de Dios Mission, the only stone mission structure reported to have been built in Florida.

J. C. Harrington, National Park Service, carried out excavations this past winter in the courtyard of the Castillo de San Marcos, St. Augustine. The primary object was to determine the location of interior buildings shown on early plans of the fort. These were located and several layers of deposition and building were also found which probably can be dated by associated artifacts. A new discovery was an Indian midden site underlying the fort.

Wilfred T. Neill, of Ross Allen's Reptile Institute, is excavating a deep site near Silver Springs. Fiber-tempered pottery in the upper levels dates from the earliest ceramic times while several earlier non-ceramic horizons are found. The primary aim of this work is to establish the position of fluted points previously found. Ripley Bullen is acting as an advisor on this work.

GEORGIA. A. R. Kelly, member of Georgia Historical Commission, reports that the commission purchased the Etowah Mounds for state development on April 8, 1953 at Cartersville, thus realizing a dream of preservation long cherished by southeastern archaeologists. W. H. Sears, University of Georgia, has prepared a preliminary statement of survey objectives at Etowah and is expected to begin initial survey at the site by mid-June or early July. The Historical Commission and the Department of State Parks will collaborate in the work of development, which is expected to continue over a period of 7-10 years. Scheduled segments of a total plan of development will be carried out each year with the Department of Archaeology of the University carrying out technical details of field exploration, survey, and museum development.

The Georgia Historical Commission is also sponsoring surveys in historical archaeology and architectural restoration of houses and outbuildings at the Joseph Vann House, Chatsworth, Georgia. Vann House is the best surviving relic of the occupation of north Georgia by the Cherokee Nation. It exemplifies the wealth and baronial affluence of a half-breed Scotch-Cherokee who visited the Georgia and South Carolina coast in the late 18th century and then built a wilderness replica of the estates he had seen. Current archaeological excavations have unearthed a kitchen and guest house and a maze of brick walks and parapets, part of a formal garden to the rear of the house. Excellent collections of late 18th and early 19th china and glass ware and other historical artifacts have been made in the garden and stable area at Vann House. Henry Chandlee Forman, formerly with the National Park Service now at Agnes Scott College, Decatur, Ga., is the architect on the project.

The Historical Commission is considering resumption of work on the Spanish Mission survey of the Georgia Coast in late June, continuing through July-August. Lewis H. Larson began such a survey last summer, centering on islands and mainland sites of Spanish-Indian contact from Darien Bluffs north to Sapelo. Currently the Fort King George Association is restoring Ft. King George, following excellent plans provided by Barnwell and other contemporaries, and archaeological indications brought out by Sheila K. Caldwell.

Joseph R. Caldwell, National Park Service archaeologist, has been engaged in survey of the Tugalo and Keowee and Seneca tributaries of the Savannah River above the Hartwell dam and reports finding several new sites in the general region of Tugalo indicating a clustering of what are presumed to be Cherokee sites.

The University of Georgia continued survey and stratigraphic analysis of several sites in the Furman Shoals basin, near Milledgeville, Georgia, during the winter of 1953. Dam construction at Furman Shoals will be completed within the year. Sites on this part of the Oconee River reveal a number of early to middle Woodland occupations as indicated from surface collections.

Joseph R. Caldwell and Carl F. Miller are doing last-minute salvage work on sites surveyed by A. R. Kelly in the Jim Woodruff Reservoir basin, Decatur and Seminole counties of southwest Georgia, in the lower Flint and Chattahoochee drainage. Mr. Miller, of the River Basin Surveys staff, began a series of excavations the latter part of March at Montgomery Fields, a large site on the Flint River. The site in question is one where a large variety of check-stamped pottery occurs. It is planned to continue operations there for a period of from six weeks to two months. While in Georgia, Miller plans to make tests farther down river at Lambert's Island. He also will endeavor to find the site of the famous Apalachicola town which is supposed to have been located on a high point between the junction of the Flint and Chattahoochee rivers. As a part of the same salvage program, Caldwell is carrying on excavations at Fairchild's Landing. That site is of particular significance because it appears to be stratified which is rare in Georgia.

Kelly will return to Kinchafoonee during the spring and reconnoiter Archaic sites around Albany and will visit the Jim Woodruff basin to inspect Lane Springs quarry site and a mound site at the Rambo Landing (reported by Moore) which is on the edge of the flooded area.

Cataloguing of field accessions from the Tugalo, historic Cherokee site near Toccoa, Ga., have been completed in the Laboratory of Archaeology at Athens, and plans for resumption of work at this site, centering on the presumptive "mound" or "townhouse" site can now be made.

The National Park Service has been digging at Ft. Frederica National Monument, St. Simons Is. from March 1 to May 1. The tombs in the burying ground were stabilized under the direction of J. C. Harrington while Charles H. Fairbanks directed the excavations. The town gate and supporting structures were thoroughly investigated. The gate structure was composed of two wooden walls 14′ apart, 24′ long with sentry boxes on the town side. Wing walls connected the gate with the town parapet; outside this parapet was a wet moat with palisades inside the inner and outer edges. Cross trenches seem to have supported the bridge. A short excavation confirmed the main cross-street of the town. The three uncleared corners of the barracks quadrangle were located by test pits. Exploratory trenches in the fort proper have shown the recently discovered Augsburger map of 1736 to be accurate in fortification details. The parapet had a tabby inner face on the east and north, and presumably on the eroded west and south sides. The fort moat was dry, five feet deep and had two palisades. The inner pine log line was at the base of the rampart. The outer, cedar log palisade was twenty to twenty-five feet out. The counter-scarp was a very gradual slope. The remains of a brick building 18′ x 65′ just inside the north curtain is tentatively identified as the warehouse and chapel. Each corner bastion contained a small square building of tabby. Floor levels were generally about 35″ below colonial ground level. Artifacts have included several whole bottles and an expanded list of ceramic types. Japanese porcelain is again present as well as considerable English Delft and stonewares. Pipes include one with the British Coat of Arms. Another has "We Save" on the stem. Any information on this style would be greatly appreciated.

Louisiana. The geological and archaeological survey of the marshlands of the Gulf Coast by Louisiana State University is progressing to the stage of analyzing the archaeological collections. This survey is a Navy research project and the archaeological phase is being conducted by William McIntyre, Department of Geography and Anthropology. The most obvious fact presently discernible is that Florida Gulf Coast pottery types extend as far west as Texas. It is hoped that archaeological evidence will permit a correlation of the ages of some of the tributaries of the mouth of the Mississippi River.

James A. Ford went to Louisiana in February as a consultant with the National Park Service and the Louisiana Park Service on the construction of dioramas and other exhibits at the Marksville State Park.

SOUTH AMERICA

Peru. Dr. William Duncan Strong of Columbia University returned from Peru in January, 1953, after a fruitful six months' season of survey and excavation on the South Coast in which he was assisted by Rose Lilien and Robert Stigler. The party, working in close cooperation with the Museo Regional de Ica, concentrated on refuse stratigraphy, and the results may be expected to throw a flood of light on many of the complex chronological problems of the area.

The surface survey work involved the recording of some sixty odd sites mainly in the valleys of Ica, Ocuezjes Nazca and south to Chala, together with parts of the intervening desert. The sites visited range from a non-ceramic, non-agricultural site on the Bahía de San Nicolás, which probably represents the earliest occupation found, to ones with sherds of the Colonial period on the surface.

The party did a limited amount of digging at the San Nicolás site, and Strong reports that the artifacts are of finely chipped obsidian. He feels that it might be possible to get geological dating for the occupation with fuller work on the site, but the party lacked the facilities to try for it on this trip.

Large refuse mounds occur on the Punta de Lomas and at Chaviña; and it is believed that the lower portions of these mounds will prove to be preceramic. The mounds at Chaviña cover about a square mile, and Strong estimates that these sites are at least as big as the famous ones at the mouth of the Ica River first

visited by Uhle. Textile fragments occur in the refuse here as at Huaca Prieta on the North Coast.

The largest and richest site of the Classic Nazca style is the famous one at Cahuachi, where the party did most of its excavating. Here, a long Paracas sequence was found underlying the Nazca one and developing into it by a gradual transition. Strong reports that the Nazca period was "a period of tremendous building activity. The Nazca people took houses and refuse mounds left by the Paracas culture, covered them with layers of reeds and cane, to stop salitre penetration, and built retaining walls and platforms on and around them. The most characteristic wall adobes are a huge conical, grooved type, but helmet and loaf-shaped types also occur. Houses are of both wattle and daub and adobe, and are in pueblo-like clusters. In addition, the Nazca people at this time took over great natural mounds, terraces and plazas left by wind and water action, and capped all three with adobe tops, making pyramids, terraces and walls. The result, from a high place, is very striking. At Cahuachi, for some ten kilometers, hundreds of such structures occur. It is hard to tell where nature ends and man begins, but the combined results are most impressive as our air and other photographs indicate."

The main occupation at Cahuachi ends with Classic Nazca, so the later development of the Nazca culture could not be traced there. The Columbia party located and dug a Late Nazca site further east, however. This site is Tello's Tambo de Copara, christened "Huaca del Loro" by Strong; it is on the Hacienda Las Trancas, on a branch of the Tunga River, opposite the huge looted cemeteries of Las Trancas. It is a one-period site with a round plastered temple and houses made of big loaf-shaped adobes. The pottery is "Nazca Y," mixed with about five per cent of Huari type Coast Tiahuanaco, according to an identification made by Richard P. Schaedel and Louis M. Stumer. The famous wooden post site of Estaqueria is also Late Nazca, from the evidence of a test excavation.

No sites are mentioned in Strong's letters from the field as being identifiable as representing a distinct Huari or Coast Tiahuanaco occupation. The Pacheco site where Tello and Olson found pure Huari type pottery has been levelled and planted to cotton.

Later sites are large and numerous; Strong's letters lump them under the heading of "Ica-Chincha-Epigonal," a designation suggesting the Middle Ica and Late Ica styles of the 1924 report. There are hillside sites of this period near the Huaca del Loro and in the Ica valley which contain thousands of rooms; the walls are of stone or rough stone and plaster. The cemeteries of this and other periods have been very thoroughly ransacked by local pothunters, but the Columbia party found and excavated some late tombs of about medium richness.

The site of Paredones and a few others are identified as Inca, but there are few Cuzco type sherds. The most common pottery locally is a simple black on red.

One odd site visited, south of the main area of the survey, is at Atiquipa, near Chala, where there are some twenty to thirty chullpas built of stones and dirt right on the coast. The pottery is mainly plain red, with some black on red. It is presumably late in date.

The party's principal excavations were those at Huaca del Loro, carried out in July, 1952, and at Cahuachi, where the work occupied the months of August, September, and October. Cahuachi was emphasized in a deliberate effort to concentrate on the chronological relationships of the Nazca and Paracas styles, and the results were very gratifying. There is a meter to a meter and a half of Classic Nazca refuse at Cahuachi, shading off below into Paracas deposits three or four meters thick. The evidence seems pretty clear that the Nazca style developed out of the Paracas one in the general area studied. The overlap is such that certain characteristically Paracas styles persist up into fully developed Classic Nazca.

The distinction between Paracas Cavernas and Paracas Necropolis, which most Peruvianists have assumed on the basis of their interpretation of Tello's excavations at Paracas, has no chronological significance as far as the pottery is concerned. The plain light-colored "Necropolis" pottery occurs mixed with the incised, post-firing painted "Cavernas" throughout the whole depth of the Paracas refuse, together with a variety of other decorative techniques such as negative painting (also found in all Paracas levels), stylus marking, rustic painting, white on red, polishing and modelling, etc.

About thirty Nazca burials were excavated, of which less than half had good polychrome pottery. The richer tombs yielded satisfactory gravelots of from two to ten pots. Cooking pots occur in these graves (as they did in the Nazca period graves Uhle dug), and fine polychrome specimens were occasionally used for cooking. Fine pots often occur in pairs in the graves. Trophy skulls are fairly common.

One extraordinary and puzzling find was a great piece of plain cloth, of the type which wrapped the famous Necropolis mummies at Paracas, a meter and a half wide and several hundred meters long which was folded into an area 18 meters long, 1.50 meters wide, and 15 cm. thick and then buried a meter or so deep. Cavernas type sherds were found with it, but no burial.

Thanks to the cordial cooperation of all the Peruvian authorities, the collections were promptly released and reached New York in March. Further results of the Nazca work can be expected as study of them proceeds.

NOTE

There remains space to mention an extremely important publication just received. This is *Cuzco: A Reconstruction of the Town and Restoration of its Monuments*, by George Kubler. This is, in a true sense, an epoch-making publication. It is a compact report, with profuse illustrations, of the archaeological analysis of the ruins of Cuzco.

Readers will recall mention in *American Antiquity* of the terrific earthquake damage done to both colonial and prehistoric buildings in Cuzco. Subsequently, the appointment of a UNESCO mission to evluate the damage was reported. The mission has performed brilliantly, not only in evaluating the ruins of Cuzco, but it has gone the second logical step, in that this report constitutes a blueprint for city planning.

So far as is known, this is the first significant effort on the part of the archaeologist to participate in a comprehensive, long-range city planning project. Planning and recommendations were based upon the local recognition of the value of the Inca remains, the value and historical richness of the colonial remains, and the crying need for the development of a modern city. Obviously, three such cities cannot occupy the same ground. The mission attempted to evaluate the scientific and historic significance of each structure. Some were recommended for preservation, others for abandonment or destruction. The better portions of the two old cities thus will remain permanently on view.

Although there will be a review of this excellent book in *American Antiquity*, attention is directed to it at this time so that members who are interested in the preservation of antiquities can know about the work of the Cuzco UNESCO commission headed by George Kubler. It is certainly worthwhile for all members of the Society for American Archaeology to know that the specialized knowledge of the archaeologist and art historian has been exhaustively utilized in a city planning effort. Many will want to own this book as a prime example of the contribution archaeology can make to areas of historic and prehistoric importance. The book costs $1.50. It can be purchased from UNESCO, 19 Avenue Kleber, Paris, 16. The full title is Museums and Monuments III, *Cuzco: Reconstruction of the Town and Restoration of Monuments*.

MEMOIRS OF THE SOCIETY FOR AMERICAN ARCHAEOLOGY

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1. *Big Bead Mesa: an Archaeological Study of Navaho Acculturation, 1745-1812.* By DOROTHY LOUISE KEUR. vi+90 pages, 4 plates, 5 figures. $1.00.
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